SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE MINES AND WORKS OF GERMANY—No. I.

MINING IN THE HARTZ.

This remarkable group of hills is situate in the centre of North Germany, rising abruptly from the alluvium covered plain on the north and west, on the south-east it gradually sinks away into the gentle undulations of South Germany. Occupying an area of but 800 square miles, these hills have been for ten centuries a busy hive of mining industry, and forming, as they do, an isolated group, cut off from communication with other parts of the country, the methods and processes have necessarily maintained a strong individuality of character. The hill peaks, varying from 2000 ft. to 3700 ft. high, form no continuous ridge or chain, but seem to be the result of direct igneous force acting in a vertical direction. Indeed, Humboldt refers to these hills as affording an excellent example of local irruptive force by igneous agency. The summits are clothed with pines, which are periodically cut down, and form the supply for the mines, and leave a considerable quantity for exportation. The roots and top-wood are carefully collected, and arranged in regular layers, in circular conical mounds, defended to windward by hoarding; the mound, covered over by fine dust from previous burnings, is then ignited, and converted into charcoal, to be used in the numerous smelting furnaces, and particularly in a peculiar iron process in the eastern part of the Hartz, in which malleable bar-iron is obtained at once direct from the ore. These pine forests are kept with great care. The shrubs are planted in diagonal rows about 3 ft. apart. This closeness has the effect, when the young trees grow up, of excluding the light, and thereby causing the stems to shoot upwards towards the light, producing great uniformity and regularity in the trees; so that in a thousand stems there are hardly ten that depart ever so slightly from the tall tapering model. A School of Forestry is established here as well as in many other parts of Germany; and great labour is bestowed on the training of overseers to regulate the economic forestry of the district. Regular records are kept of the dates and quantities of timber planted and felled on each hill, and examples of each stage are seen—the bare hill-side with its groups of stacked wood—the young fresh-planted shoots of firs 2 or 3 ft. high—the light-green foliage of the youthful forest—and the darker hues of the riper woods, where the woodman's axe is heard and the charcoal burner seen.

Geologically, these hills are igneous in the interior, with porphyry, clay-slate, and mica schist overlying the flanks. The matrix in the mines we visited was everywhere porphyry or grauwacke, though in the eastern and lower portion of the hills Silurian and Devonian beds are found, lying, for the most part, conformably upon each other. The western part of the district abounds in veins of silver, lead, copper, antimony, and arsenic; and the eastern part contains iron, much of which is gotten by open work and smelted on the spot. Most of the furnaces, however, are very small; we saw only one that would exceed 50 feet. The coal has to be brought, mostly in the form of coke, from the Elberfeld and Dortmund district. The veins of ore in the lead and silver mines are very numerous, and vary in width from a few inches to 30 or 40 yards. The dolomite and flookan found in English lead mines are in the same manner regarded as indicators of the proximity of the ore, and when the vein impoverishes and closes up it is persistently followed, often for 50 or 100 yards before it again becomes ore-bearing.

The deepest mine in the Hartz is the Samson, near St. Andreasburg, 2781 feet deep. We descended this by means of the man-engine, a contrivance scarcely known in England; but we need not describe it here more than to say it consists of two parallel hoists, worked alternately up and down by a water-wheel giving a stroke of 9 feet. Steps are fixed on the hoists at corresponding distances, and the miner, by cautiously stepping from one to the other at the moment when the steps are level, is conveyed with little or no personal exertion up or down the shaft. A working model of this machine is in constant operation in the office, moved indeed by a connecting-rod from the real machine, so that the exact situation and position of the apparatus every instant is in minutiæ under the eye of the manager. The first thing that strikes an English observer is the immense size of the shaft at the top, and the fact that the water-wheels and the hoisting and winding gear are fixed in the shaft, some 30 or 40 feet below the surface. This is done to secure a better fall, and to economise the water, which is carefully collected on the surface and stored up in ponds and reservoirs for use when wanted. Every hollow is taken advantage of to collect and preserve water. The winding of ore was not continuous as in coal and iron mines, nor are the skips or buckets so large, but the ore being very heavy their general charge is a little under an English ton. The nature of the workings is the ordinary vein form. A headway being driven along the course of the vein, the ore is got out, upwards, 3 or 4 yards, for a space of about 20 yards long; then a kind of timber roof is put in over the original road, which is to be kept as the drawing way. This roof, consisting of cross-pieces of timber, is covered over with the debris from the works, which thus forms a standing place for the men to continue their upward excavations. The refuse is thrown under their feet, and gradually raises the floor, while the ore is dropped through small shafts, left every 20 yards or so in this floor, and communicating at the bottom, through a hopper, with a wagon in the original drawing road. When one such length of work gets up a few yards a second length is begun at the level of the drawing road, which is worked in the same manner upwards, and rises in the same proportion with the first working, and so on a third and fourth length of work is opened, each a stage lower than its neighbour, and communicating forward with the next higher level, and backward with the next lower. Each level, unless where from the nature of the vein the working length is very short, has its little shaft for sending down ore to the skips in the drawing way. Several such headings and risings were in active operation in the Samson Mine, in one of which the walls of the vein had gradually come together, and for a distance of 30 yards the vein had been represented only by an occasional string of quartz, but it was still being steadily pursued, in hopes that it would again become ore-bearing. In many places instead of rising workings from the level, it was found more advantageous to dig into the sole of the drawing road, which mode is known in England as understoping. There are no less than 80 such excavations in this mine, which are looked upon as the best examples of understoping to be found in the Hartz mines.

The ores obtained in this mine are numerous and valuable—galena, silver as sulphide, carbonate and chloride, arsenical pyrites, arsenic and antimony, nickel, &c. Many good and rich specimens were visible in the various levels. Those parts of the vein which we visited averaged 5 feet wide, but throughout the mine, the manager stated it varied in the width from 1 to 2 metres—*i.e.*, 3½ ft. to 6½ ft. The average richness of the veinstuff is 3½ to 4 per cent. lead, with a very fluctuating amount of silver; as, besides the silver associated with the galena in the ordinary manner, there is found here a considerable quantity of sulphide of silver mechanically mixed, or at least associated with, the other ores, also several compounds of arsenic and antimony, from which arsenious acid is manufactured.

In the lower levels of this mine there is a strong supply of water, but in common with the rest of the Hartz mines it is drained by a splendid adit, running nearly at the level of the sea, and communicating with the neighbouring mines to receive their tribute. Pumping is not resorted to. The whole of the mines in the Hartz are worked by the Government, and it is considered more economic to drive a common level for a group of pits than to erect pumping-engines where coal is so dear. The ventilation in the Samson Mine was generally good, the water levels serving also as air-ways, but in some of the levels it was far from satisfactory, arising partly from the large flames of the lamps, and the unpleasant smell of the burning oil. In this mine a bell is kept continually ringing, governed much after the fashion of the floating ball. The sound is an indication of safety, but on the rising of the water or breakage in the machinery it stops. The veinstuff was blasted in the ordinary manner with shot-holes of 2 ft., and from these being generally blown clean to the bottom we inferred that the driving was not difficult.

In the Caroline Mine, two miles from Clausthal, we observed greater cleanliness and better ventilation in the working galleries. The vein was 10 ft. wide, but by no means so regular as in the Samson. The vein here frequently thickens out into huge chambers, and the workings of course follow suit. The chief ore was galena, yielding, when dressed, over 70 per cent. lead, and 100 ozs. to the ton for silver. The hoisting and winding gear were driven by four water-wheels fixed, as before, in the shaft, and in such manner as to use the same water successively. This pit produces 1200 tons of crude ore per month, and finds employment for 2000 workmen.

Women and boys are not employed in these mines. Boys are engaged in the dressing floors from the age of 12. A striking feature in these mines was the evidence everywhere visible of an unseen intelligence directing the progress of the works, and providing with scrupulous care for the safety of the men. Accidents in the mines are very rare. There was none of the slipshod slovenliness so common in the South Staffordshire mines, nor of the short-sighted economy to be seen in some of our Cornish and Cumberland works. The mines are directed by a principal engineer and staff, whose head-quarters are at Clausthal, under whose direction also is the famous School of Mines, in which students from all parts of the world learn the theory and practice of mining. Every student is required to spend some hours each week in actual work in the mines, but we found, from various conversations with students, that this portion of duty, in practice, is generally represented by a quiet contemplation of the miners at their work in the various heads, assisting their vigils meanwhile by the usual "aids to reflection" in such constant use throughout the Continent. The use of tobacco, indeed, is all but universal—the clerk in the office, the surveyor with his dial and plans, the banksman who lands the bucket, the student with his books, the woodsman with his axe, and the boy of seven or eight summers, all are incessantly smoking. The quantity of beer consumed is enormous. It is, however, of a mild nature, devoid of the heating properties of English ales, and but slightly intoxicating. The Mining School at Clausthal is well supplied with apparatus, and especially so the chemical laboratory. The model room is very interesting, containing working examples of all the various forms of crushing and stamping mills, elevators, Setz machines, and other shaking tables, German, circular, and Zenner buddles. Furnaces and ovens of all sorts, winding and pumping machinery, apparatus for landing skips, safety cages, roasting kilns, &c. We were especially interested by a dissecting model of the estate of the Dorothea Mine. This model, executed in wood, was so arranged as to take to pieces, exhibiting the section of the estate made by the vein, and also various other sections, to show the subordinate feeders to the vein, and each level and passage in that intricate working. The annual profit of the Government exceeds 3,000,000 thalers, or about half-a-million sterling.

LLANBRYNMAIR (MONTGOMERYSHIRE).

And what about the picturesque mountain village of Llanbrynmair, nestling as it does at the foot of so many hills radiating from it in all directions, and presenting a view of varied beauty not to be equalled in any other part of North Wales? Only that the mysterious voice of prediction has gone forth that this favoured locality is destined to be the centre of a great mining industry. This lovely spot, and its truly comfortable inn, have long been known to mining men. For years past frequently might be seen Mr. John Bright fishing in the river when visiting his Dyliffe Mine, a few miles distant, but rumour says this mine has lately changed hands. The directors of the Van (no mean judges of a good hotel) stop here, their mine being within a ten miles ride. Sir Edward Conroy's mine, which has returned for years past 100 tons of lead per month on an original outlay of a few hundred pounds, is within two miles of the village. And now one of the principal mountains is about to give up its hidden treasure, for treasure it must possess if what every miner says be true, and if its name signifies anything—Rhiw Mwyn, or Mountain of Mineral. This name it derived, no doubt, from its being worked by the Romans, who had an encampment near, and superficially worked its lead lodes that cropped out to the surface.

Some months since a few gentlemen acquired a mineral lease of this mountain, extending four miles on the course of the lodes, and formed a small company, under the title of the Fronvellan Lead Mine (Limited), with a capital of 4000*l.*, to explore the lodes. An adit level at the base of the mountain has been driven near a quarter of a mile in length, and has intersected two fine lodes. One, the champion lode of the district, is 13 ft. wide, composed of a beautiful matrix for the production of mineral. At the point of intersection this lode is disordered by a slide, but on driving away from its influence the lode improves daily, and contains more lead and carbonate of lime. The lead at present makes in small ribs of solid ore. In another 10 fms. driving the point will be reached which in the level 50 fms. above produced 2 tons of lead ore per fathom. Great interest is, therefore, evinced in the neighbourhood to see if this wealth of mineral holds down. A shaft will forthwith be commenced, and taken up from the bottom level to surface, instead of the usual and expensive plan of sinking, thus avoiding costly steam-power, pumping and winding machinery. At every 10 or 15 fms. levels will be driven on the lode, right and left of the shaft, and the ore returned.

It is worthy of remark that five localities in Wales, in five different counties, that have borne the name of "Mwyn" have each proved eminently rich in mineral wealth. For instance, Rhyd-y-Mwyn and Pant-y-Mwyn Mines, in Flintshire; Mwyn Glawdd (the Minera), in Denbighshire; Craig-y-Mwyn, at Llangynog, Montgomeryshire; Esgair Mwyn, Cardiganshire; Nant-y-Mwyn, Carmarthenshire; and, lastly, Rhiw Mwyn, at Llanbrynmair, which is now being developed.

The noted Llanerchyraur lode of the Conroy Mine runs parallel to those of Rhiw Mwyn, and possesses a somewhat similar position. A deep adit level was driven some 150 fathoms before the lode was cut, and then over 100 fathoms were driven on the course of the lode before the great body of ore was reached. This was immediately followed right up to surface, and has produced 100 tons of ore a month ever since. Similar predictions are now foretold and looked for from Rhiw Mwyn, not only by the miners working there, but by those employed at other mines in the neighbourhood. Since mining operations have been carried on by the Fronvellan Company at Rhiw Mwyn several other lodes have been explored by other parties—the Ednant, the Cwm Nant-ddu, and the Cwm Bychan Mines. On the floors of the latter mine is to be seen some splendid lead ore. There is also an interesting feature to be remarked on the mountain side, near the mine, which was also worked by the Romans, who must have smelted the ore on the spot, or rather in elevated and exposed places, that would catch the wind to fan the furnaces. A great quantity of slag and half-melted lead may soon be gathered here. If this fact, taken together with the extensive workings along the surface of the lodes, be any criterion of the wealth of mineral in depth, the Cwm Bychan Company may look forward to a bright future on systematically opening out and working the lodes. The lodes in this mine also run parallel to those of Fronvellan, or Rhiw Mwyn.

If any reader has not visited Llanbrynmair let him go by all means. There is here to be found something of interest to amuse and suit everyone. To the traveller who knows the discomfort of a modern hotel we say stop at the Wynstay Arms, and experience the luxury of being made comfortable and plenteously fed, but do not forget to ask for that particular sherry kept for "Sir Watkin" when he comes with a shooting or fishing party. If you are a fisherman one of the many rivers, lakes, and streams will always give you abundance of sport. If you are an archæologist the Druidical and Roman remains will give you theme for contemplation. If an artist, depict the fine cataract of Ffrwd Fawr, where the river Twymyn makes a perpendicular descent of 130 ft., or picture the many lesser falls of even greater natural beauty which abound on all sides. If a miner or geologist these hills will give you abundant scope for examination, for new lodes are frequently being discovered. It was but last autumn that a nutting party discovered cropping out in a hazel wood a lode now being actively worked by a large number of men. In short, there is no spot in North Wales that combines so many attractions that the tourist seeks as at Llynbrynmair, on the Cambrian line.

THE SLATE DISTRICTS OF NORTH WALES—No. V.

When writing of the formation of slate in an earlier paper a general description of the slate beds of the Festiniog district was given, their position in relation to one another, and to the intervening bands of trap with which they are associated. No more, therefore, need be added here on those points. Geologically, the veins of this district belong to that portion os the Lower Silurian system which forms the horizon of Cader Idris, the Araus, the Arenigs, the Manods, and Moelwyn, a lower horizon and earlier formation than that of Snowdon, and the mountains to the North.

The Festiniog slate deposits lie about two miles north of the village, and as far as they are valuable are comprised in a small space about three miles long by one in width, extending between Y-Gamallt on the east and Moelwyn on the west, having the line of the two Manods for its southern boundary. With the exception of two or three small plots, the freeholds of the companies working the quarries upon them, the whole of the land within this area is, we believe, the property of three or four large proprietors, and is now let on quarrying leases to about a dozen parties, either private associations or limited liability companies. The slate, however, does not occupy anything like the whole of this extent, at least sufficiently near the surface to be workable, the beds being broken by several north and south faults into patches, from 100 to 200 yards to half-a-mile in width, which are thrown down successively towards the south, as they strike east, or, as is more probably the case, have been thrown up towards the west, the dip being at a higher angle in the western quarries than those to the east. The veins dip a few degrees west of north, at angles varying from 18° to 30°. The inclination of the planes of cleavage is in the same direction from 5° to 10° higher, the greatest difference in the angles being in the most elevated beds. There are three workable veins or four, if we include the soft inferior upper vein, separated from each other by the hard bands before mentioned, all of a uniform blue colour, fine grain, and remarkably good cleavage, though the different veins vary in these last qualities, and the same vein even in different places. The palimis borne by the middle one of the three, known in the district as the "old vein," which is perfect in both respects wherever it is present, though unfortunately in some of the quarries it is but of little thickness. However, throughout the whole of the district the cleavage is very good, and in a great deal of the stone so perfect that it will split to any degree of thinness, thus offering a great temptation to the workmen, who are paid by number not by weight, of splitting the slates to a degree of tenuity inconsistent with strength.

The production of the Festiniog veins is larger in proportion to the number of men employed than that of the other districts; this is

probably due, in a great measure, to the plan there so universally adopted of sawing the blocks into convenient lengths, which, by leaving an even edge, gives a great advantage to the splitters, but is also to be attributed to the greater fineness and uniformity of the rock. At the Welsh Slate Company's quarry (the late Lord Palmerston's) the proportion of marketable produce to rock quarried is about one to seven or eight; but this rate is exceptionally high, the ground there being particularly undisturbed, and the slate vein in consequence more solid, and freer from joints than usual. The more common proportion is about 1 to 14 or 15, an amount which, small as it may seem, compares very favourably with that of any other district, and which, were it not for the greater cost of labour and of materials of all kinds in this neighbourhood, would leave a larger margin of profit to the adventurers. The number of workpeople employed in the quarries is about 2000, and the annual production nearly 120,000 tons. Of this quantity, from 45,000 tons to 50,000 tons is the make of the Welsh Slate Company alone, with an establishment of 600 persons, which amount, it is said, they could increase to 60,000 tons on an emergency. We doubt, however, whether the district, generally speaking, will be able to increase its production much, however great the demand may be, until some of the younger quarries are worked on a larger scale, and get more extensively opened.

One of the greatest drawbacks to these quarries is the great cost of labour, dependent partly upon the high price of provisions, &c., but more on the excessively high house rents paid in the neighbourhood, and the distance many of the quarrymen have to come to their work, from inability to obtain dwellings near the quarries. The first of these causes may be difficult to remedy in such a barren situation, where almost every article of consumption has to be brought from a distance; but the second might be easily removed, were the landlords as alive to their own interests as Lord Penrhyn and Mr. Assheton Smith.

The manufactured produce is sent down to Portmadoc by a little railway thirteen miles in length, which, as it winds along the sides of the mountains, overlooks one of the most beautiful valleys in Wales. This railway has lately attracted much attention, which from its many peculiarities it well deserves. It has a decline of 700 feet in the short distance it runs, the average gradient being 1 in 92 the highest, 1 in 68, and the guage being only 2 feet admits of a sharpness of curve, as well as other engineering advantages, invaluable in such a rugged country. But everything connected with narrow-guage railways is so ably treated in a work by Mr. Spooner, the engineer of this line, that we will not enter further into the subject, as it is foreign to the object of which we are writing. A very large portion of the Festiniog slates are exported to the Continent, principally to Germany, where they are highly esteemed, and to the southern ports of the United States. During the Franco-German war the trade of this district suffered severely, the orders from Germany having been suddenly stopped; however, since the restoration of peace the foreign demand has again sprung up, and perhaps was never more brisk than at the present time.

In the Cambrian deposits, forming the great Merionethshire anticlinal, many unsuccessful attempts have been made to work the veins of greyish green and purple slate, which are here and there interspersed amongst the great beds of coarse grit that principally compose the rocks of this region; but although towards the lower part of the series the slaty beds have attained a considerable thickness, the materials of which they consist were too coarse and gritty, and not of a sufficiently plastic nature when originally deposited, for the characteristics of true slate to be developed in them, as it was in their fellows in Carnarvonshire, even by the intense converting forces to which they must have been subjected. In addition to this innate unfitness, they have undergone so much subsequent contortion and disturbance, and have been rendered so small and jointy thereby, as not even to allow of their being made into the thick, heavy roofing slates for which similar rock in the North of England is used. The same remarks apply to the quarries opened in those members of the Silurian system that, circling round the Cambrian rocks of Merionethshire, lie below the horizon of the Festiniog veins; and also to the same strata in Carnarvonshire and Anglesey. Money spent in them is simply wasted.

On the horizon in which the Festiniog veins are situated, throughout the whole of its extent, there are small patches of inferior slate, that in many places have been quarried for local use. But in consequence of the impurity of the original material, and the imperfect conditions under which the cleavage was produced, this slate has nowhere attained the closeness and toughness of texture, and trueness of cleavage, that it has done at Festiniog; it is also generally contaminated by the presence in it of much iron pyrites, which by its decomposition soon renders the slate rotten and perishable, so that as commercial speculations these quarries have failed. Above this horizon no true slate has been found, though a great deal of money has been spent in the search for it; and where any material of the slaty character has been met with the remarks just made about the slates outside of the Festiniog district apply to it. As a rule, Silurian sedimentary deposits above the horizon of the Festiniog veins are too coarse and sandy to have become converted into slate, except under the influence of far more powerful forces than they appear to have been subjected to; and, moreover, are wanting the protecting hard bands, as far as we have been able to observe, which would have beneficially modified whatever metamorphic action has been applied to them. The consequence is that the greater part of the rough materials are unprofitable even for slabs, and in the few places where the sediment was sufficiently argillaceous and homoneous to have beeome slate it has developed no further than into shale.

During a period of depresion or slackness of demand in every branch of industry there is little fear of money being recklessly invested in it. It is when the demand for an article increases at a greater rate than the ordinary sources of supply can meet that people are tempted to leap into speculations before they look well at them—a process now going on, we fear, to a great extent in metalliferous mines of all kinds. A period is probably approaching when such will be the condition of the slate trade, in common with so many other branches of mineral industry. To future investors in slate quarries we will give a warning to consider carefully where and how their money is to be spent. In each of the four districts described are properties which we believe will amply repay a judicious expenditure upon them. Out of these districts we fortel nothing but loss and disappointment to the adventurers. But even in them economy and judgment are very essential elements of success. Of the quarries now eminently prosperous many have caused serious loss and anxiety at their commencement, and have been pronounced worthless by those whose ignorance and want of care have led to the evil result. Want of geological knowledge has induced perseverance in trials which those better informed would soon have abandoned; and a fallacious notion that the larger the number of persons employed, and the more rapidly capital was expended, the sooner profits would be made, has led to extravagance and waste. Both time and money must be spent in bringing a slate quarry into a profitable state, and unfortunately in many instances a great deal of each of them is required; though, when fully developed, few investments of the kind are so permanent, or make a larger return on the capital.

THE SLATE TRADE.—The slate trade at Port Madoc is at present very active, as the following statement shows:—

Quantity of slates shipped at Port Madoc during the quarter ended June 29:—

Welsh Slate Company	Tons	13,348	14 1
Mr. S. Holland, M.P.		5,289	0 2
Mr. W. J. Greaves		4,613	18 3
Messrs. Mathew and Son		4,763	8 2
Mr. F. S. Percival		2,670	13 3
Cwmorthin Slate Company		2,901	6 1
Diphwys Casson Slate Company		2,850	16 3
Festiniog Slate Company		2,116	2 2
Rhosydd Slate Company		1,274	18 3
New Craigddu Slate Company		611	9 2
Croesor United Slate Company		465	19 2
Cwtybugail Slate Company		584	8 0
Macnofferen Slate Company		372	19 2
North Wales Slate Company		54	0 0
Llynydrum Slate Company		92	5 0
Messrs. Richard Williams and Co.		48	14 0
Total	Tons	42,053	15 2

By ships, 37,229 tons 19 cwts. 3 qrs.; by rail, 4823 tons 15 cwts. 3 qrs.

COAL MINES REGULATION BILL.

UNDERGROUND COLLIERY MANAGERS.

SIR,—It will be remembered that the West Yorkshire Underground Viewers' Association, which comprises something like 200 collieries in that district, and of which we were the deputed representatives, has been endeavouring, as far as possible, to render some of us (as members of that body) eligible for a seat at the new board of certifying competency, if chosen.

Probably no clauses of the measure have been more fully discussed, and certainly none have cost more—if so much—difficulty in their attempted settlement, as Clauses 25, 26, 27, and 28; but Mr. Bruce (mainly, we are bound to add, on the suggestion, and as we believe through the indefatigable exertions, of Mr. Wheelhouse, M.P. for Leeds) has made the important modification of admitting managers and viewers of mines as eligible for such seats; thus, probably, including any one of us who may hereafter be elected, especially when combined with the provisions of Clause 28, which seeks to exact that *certificates of service* shall be granted to every person who, at the passing of the measure, was acting, and has since acted, or who has at any time within five years before acted, for a period of 12 months in the capacity of manager of a mine, *such certificate of service* having the same effect as a certificate of competency under the Bill.

THOMAS STEPHENSON, BENJAMIN KEIGHLEY, } West Yorkshire Underground Viewers' Association.

July 18.

VENTILATING AND PREVENTING EXPLOSIONS IN MINES.

SIR,—Mr. Hermon, M.P., on Nov. 9, offered a premium of 200*l.* for the best essay for the prevention of explosions in mines. In three days after seeing the offer I sent him the following plan:—I propose to light up the mine with gas after the manner of a town, with gas apparatus on the outside of the mine, and the lights to be protected by shades; and when the mine has got well cleared of gas it may be lighted up with perfect safety, and will consume the gas as fast as it comes into the place; it will always prevent that dreadful accumulation that is so destructive to life and property. The workmen may work with an open gaslight with perfect safety.

Five weeks after I sent another plan. I propose closing in the top of the down-draught shaft with good masonry, and a strong timber covering, to be thoroughly sealed up—then I place a large winged bellows on the top of the timberwork, with an aperture sufficiently wide to put a short pipe tight in the woodwork, and a powerful engine attached to it, it will soon be found to fill the mine with fresh air to any degree desirable; and by closing up the cupola shaft, and the working shaft, which can be easily done, it can be filled up to a considerable pressure; and when let loose again will free the mine of all noxious gases. I hold the plans to be positive, for the air cannot get back against a powerful engine.

If you will have the kindness to insert my plans in the *Mining Journal* I shall esteem it a great favour. CHAS. HANSON.

Chapel Hill, Huddersfield, July 12.

THE SHROPSHIRE COAL FIELD.

SIR,—In the Journal of July 6, under the heading, "Report from North and South Staffordshire," it is stated that "Mr. D. Jones, the President of the South Midland Institute of Mining Engineers, expressed an opposite opinion last Monday in an address to the members, an outline of which appears elsewhere. From Shropshire, in the direction of Wolverhampton is, he believes, all barren ground." The President of the South Midland Institute of Mining Engineers is Mr. Edward Jones, of the Granville Lodge, near Wellington, and not myself. As far as *my* opinion on the subject of the coal measures existing between Shropshire and South Staffordshire is concerned, I may say that I am prepared to find a large area denuded; but I do not think the Western Boundary Fault of South Staffordshire is a cliff of coal measure left by denudation. The question of the nature of this fault was thoroughly discussed at Dudley at a meeting of the East Worcestershire Mining Engineers about 12 months since; and the weight of evidence adduced was in favour of its being a dislocation. I believe, therefore, that on the South Staffordshire side of the district there will be found much coal unaffected by the "Symon" ground, as they call barren ground in Shropshire.

Albrighton, Wolverhampton, July 12. DANIEL JONES.

SOUTH WALES COAL TRADE—NEATH RIVER.

SIR,—Some two or three years ago you gave me room in your largely circulated paper, wherein I endeavoured to point out the great desirability, and an immense saving to colliery proprietors, copper smelters, tin-plate makers, chemical ironmakers, and merchants generally, by making Neath River a floating harbour; if completed, I showed that vessels could lay in safety and security from all winds, besides vessels always lying afloat, with the satisfaction it would afford the inhabitants of this thickly populated hive of industry in having their boats to row and ply upon the surface of clear water from the mouth of the Channel to Neath, a distance of over two miles. I am pleased to inform you that since my last report the spirited proprietor and coalowner, Mr. Bevan, has shipped large quantities of coal in the Neath river; and I have observed no less than from 12 to 15 vessels waiting for their cargoes. The only reason I could give for so many waiting is that he has only one small communication from the canal to the river; but why the Great Western Railway has not made their sidings to the river has baffled the whole of the inhabitants of the district, having such great advantages, superior to any in the Bristol Channel, and close to the centre of the South Wales Mineral Basin. I find the Glyn-corrwg Railway Company are positively paying the Great Western Company a large sum per annum for way-leave over a few chains of their line and other dock dues, whereas they could continue their own line down to the beautiful river of Neath, a very short distance, at a vast saving to the company. There are a great many improvements and developments of collieries that call for some immediate steps in facilitating the immense resources now in construction; as, for instance, they are re-opening the Old Gnoll Collieries, formerly belonging to Sir Herbert Mackworth, and are spending large sums of money with the expectation of shipping large quantities of coal to the Neath river; and Mr. David Bevan, who is shipping immense quantities of coal, and who has got one of the longest acreages of minerals in South Wales, and spares no expense in carrying out whatever he takes in hand, with the latest improvements, in bringing to the surface the black diamond which Wales is so famous for, he has recently taken about 3000 or 4000 acres in the Dylais Valley, and is now sinking immense shafts, and expects that in less than two years to be shipping at least 1000 tons a-day therefrom. The inhabitants of the place wish him every prosperity, and especially as he travels in the footsteps of his excellent father, under whose supervision and management the old English Copper Companies were so well arranged; and if his plans were continued, would have led them on to victory.

The Dynevor Company have sunk two shafts, one of which has reached the coal, and I am told they average from 3 ft. to 4 ft. in thickness, notwithstanding all that was said by some of the old mining men of the district that no coal existed there, the spirited proprietors, Messrs. Moore, Moore, and Co., putting every confidence in their young manager and surveyor, prosecuted their works, and have succeeded, with every credit to them for their perseverance in so doing.

The Neath Merthyr Steam Colliery Company (Limited) have relayed their road, and the engine can travel from the top of the incline to Blaen-y-cwm, a distance of two or three miles, in four minutes; this has greatly facilitated the working of the colliery to advantage. The vein of coal at Blaen-y-cwm is exceedingly good, and proved to be, beyond doubt, equal to any in the district for locomotive and Admiralty purposes. I hear they have recently taken the great Cefnmawr mountain, over 600 acres, besides Llwyncaidwr, making the whole in a ring fence about 1000 acres, which is a most valuable property, and cannot fail, with proper supervision and management, being so near the shipping port, and can all be worked by levels, therefore saving immense expense in machinery and sinking of shafts, which in some parts of Wales cost 100,000*l.*, besides not having that deadly enemy the fire-damp to contend with—which this district hitherto has happily seen nothing of.

There are other large resources lying between Cefnmawr fault, precisely the same in quality, that can be won by shallow pits, over 1200 acres, and adjoining the Welsh Freehold, recently brought out as a company with large capital. I have no hesitation in saying, providing this estate is divided into three takings, or three companies, having such nearness of access to the shipping port, and the very small capital they will require to develope them compared with other pits in the district, that this would prove one of the best and cheapest paying concerns in existence.

I have just heard, I am pleased to say, that our worthy Town Council gentlemen of Neath are simply waiting for the report of the engineer, Mr. Brairton, as to the floating of the river. I conscientiously believe that all the elements necessary for carrying out the same will be forthcoming, especially as we have such men as Mr. Whitworth, of Northampton, who has recently bought the property, with other great men of the district. CORRESPONDENT.

THE BEST MINING MACHINERY AND TOOLS.

SIR,—In the Supplement to last week's Journal a "Former Correspondent" offers Twenty Pounds as an incentive to mine agents and others to communicate their opinions on the best mining machinery. I think the writer should have stated a little more explicitly what his requirements were:—

1. Is the machinery for a tin, lead, copper, iron, coal, or gold mine?
2. Depth already attained, and what machinery is now employed? Is there plenty of water power, or will steam-engines be used exclusively?
3. If to be shipped abroad, is the land carriage difficult—say, on mules' backs, bullock drays, or similar to home carriage? This materially affects the details of mining machinery.
4. Length of time given for sending in the papers; also other conditions to competition; as many might think it desirable to collect the information required—not with a view of obtaining the premium, but with the motive of disseminating and acquiring information. STUDENT.

MINING v. RAILWAY AND OTHER SPECULATIONS—No. III.

SIR,—I read with very great interest the recent letters of Mr. N. Ennor in the *Mining Journal*, and being a practical miner myself, having for a quarter of a century been familiarised with mines in Cornwall, Devon, and South Wales—tin, copper, lead, and silver-lead—I entirely concur with what Mr. Ennor has written. I am of the opinion that in these letters he has conferred a benefit upon the mining interest, and has read lessons—or rather written them—which both miners and investors will do well not to forget.

These communications are very much calculated by their clearness, explicitness, and genuine honesty to draw the attention of capitalists to the subject, and show them the fact which they have been so slow to learn, that if investments in mines have turned out badly in some cases—I won't say many cases—it is not because the class of investment is bad, but because the investors did not seek intelligent counsel. They have run in flocks like sheep, grasping at any investment made popular by the Bulls; and eagerly parting with good property under a temporary unpopularity, caused by the tricks of the Bears.

If investors mean to purchase a ship they will not send a ferryman to report upon it. If they want to buy an estate they will not send a Cockney, who "does not know a goat from a gambet." They will in the one case obtain the advice of a naval architect who builds ships, or an experienced "Old Salt," who has

"Traversed the ocean, and lived in a ship."

And in the other case they will chose a thoroughly professional estate valuer, using, of course, their own common sense and general information subject to such counsel.

Now, Sir, the drift of one portion of Mr. Ennor's letters was to show the fact, which to the bitter experience of many has been of too extensive occurrence, that persons unskilled in mining, or skilled only in some cognate branch of information, have in mine inspection been substituted for the real miner, who knows the ring of the ore, and the face of it, as well as he knows the voice or the countenance of his child.

A man may be an excellent judge of metals and be ignorant of mines. He may be able to buy and sell tin and copper, or to smelt them, and be utterly ignorant of the character of lodes where the metals are found. An excellent metallurgist might find a mine as great a curiosity to him as a balloon or a diving-bell.

What would the best assayist know of the lye of a lode, its dip and inclination, where to find it, and how to follow it?

It is notorious that excellent geologists (and far be it from me to depreciate that noble and useful science) are "as much at sea" in a mine as they would be in a Kinsale hooker, or an Indian canoe. It is true they could say a great deal about what Mr. Ennor calls "the freaks of nature," for who can study geology without perceiving some of the most striking occurrences of the phenomena which Mr. Ennor thus designates? But he would not know them as a miner does, in a mine and for mining purposes. The unlettered man, practically conversant with the ways in which metallic deposits are distributed would give opinions far more to be relied upon in this matter than the learned and gifted philosopher as a theorist.

Well, if anyone should ask me, as the Quakeress did her wooer, "What is the end of thy carnal reasonings?" I answer, with him, if not exactly "to make thee mine," at all events to show that only he who can mine is the proper person to be sent to inspect a mining property, and upon whom reliance can be placed for a genuine and sound report.

In connection with these considerations there is another matter, strictly akin. Not only are men sent down with an imposing reputation for something else to make a report upon property of this nature, but the inspection is superficial and inadequate. The great man comes, and like the King of France in the lampoon, "marched up the hill, and then marched down again." He goes away, and in pompous language says he thinks so and so, although he could not possibly have given much thought to the transaction. If a vain man, he will despise the opinions of practical men; and if he does make a painstaking investigation, he will have to depend upon practical miners, who could have made the report without him.

A visit, an inspection, and an offhand report upon general appearance is not the thing to be done. No person would buy a factory after once "walking over it;" he would, in all probability, pay another visit, and a third, and it may be a fourth. So it should be in the case of mines. A man, whatever his intelligence, must make himself thoroughly acquainted with the peculiarities, as well as generalities, of a mining property to do justice in a report. So much is this the case that it is invariably desirable, if not in all cases absolutely necessary, that a person employed to report upon a mine should be well acquainted with the mineral ground of the county or district in which it lies.

As an illustration of some of these remarks, I will select Tresavean, which was once the richest mine in Cornwall. The bargains, or tributes, were generally let bi-monthly, and upon such terms as were settled by the agents. These were, and are I believe, the acknowledged rules in all mines in Cornwall and Devon.

Some few days before the setting the tributers, *always the most experienced* men in every mine, would go and inspect the various pitches, or pieces of ground to be let; and I think during the whole of my opportunities for observation I never met with a man, or any number of such (as they generally act in companies of from two to ten) that ever took a piece of ground without seeing it twice, or in the majority of cases three or four times.

If men acquainted with the lode, its dip, direction, slides, and droppers falling into it, and also the geological formation of the country surrounding it, require a second and third inspection before pronouncing an opinion as to its value and probable results, how is it probable that any living man can by a brief visit and a look over determine it? Moreover, the native miners, who take all this trouble, must earn what they get by the sweat of their brow; their existence, and that of their families, depend upon it. No doubt if the

ex officio inspector from London was as vitally interested he would show the same earnestness and painstaking.

If it be important that adventures secures the opinions of practical persons, it is at least of equal importance that the management of the mine should be committed to such. Mr. Ennor, in one of his communications to you, with the dry humour and racy good sense for which he is so well known, satirises the fussy self-reliance and precipitate projects of a superintendent theorist, while a man who knew what the mine was, and what could be done with it, stood by silent and unconsulted, afraid to offer the expression of his judgment.

The remarks of your useful and able correspondent on the subject of stamping are also important, as well as historically interesting. In a word, Mr. Ennor has urged upon you what for many years my letters have pressed upon your readers' attention. Again and again have I impressed upon you the thought, "I long to see improved machinery brought out, to enable those engaged to bring more into the market at less cost." I urged that *not because tin was at a high price*, but more than ever when it was low; had this been done many mines which were closed during the depression would have remained open, to the advantage of all concerned.

The state of the metal market should call the attention of all intelligent men to these topics, and to every topic connected with practical mining. It is remarkable as illustrating this, your able contemporary, the *Times*, for many years contented itself with a quotation from the Journal every Monday morning on the subject of the metal markets. Now nearly every day it has original notices, and the progress of Cornish mining, and the delusions of many American schemes, are constantly noticed. It is the opinion of the wisest practical men, as well as experienced merchants and theoretical political economists, that there is a long spell of good work before us, that metals and men will cost more, for no one knows how long, and that it is a duty imposed upon us to bring science to the operations of our mines, and by machinery worthy of such work take out the ore and prepare it for the market.

In 1864 the copper ore raised in Cornwall was worth 644,000*l.* (in round numbers), and in Devonshire 197,000*l.* The tin in the former was worth 862,000*l.*, and in the latter 20,000*l.* Considering the advance in the price of these metals, and the extraordinary development of science in every other department of enterprise, the proportion now raised ought to assume a far greater magnitude than it does.

I have not space in my present letter or I would show the greatly increased value of mines within the last year-and-a-half in detail, nor yet can I do it here in the aggregate; but the increase on 21 mines is 1,259,425*l.*, irrespective of dividends paid amounting to the sum of 1,855,741*l.* I shall trouble you on this particular point with another letter.

Grateful to you, Sir, for the space afforded me in your columns, and to Mr. N. Ennor for so felicitiously calling attention to these matters.—*Gresham House, London.* THOMAS SPARGO.

ON THE FORMATION OF GOSSAN.

SIR,—The effort of Dr. Phipson, in the *Mining Journal* of May 18 to enlighten us on an important subject I regard as being most commendable and praiseworthy. It is certainly the true province of science to ally itself with practice, so that its application may no longer depend on the plausibilities of its theory, but on the solid basis of demonstrated utility. The day is past when anyone whose opinion is worth having would betray the temerity to assert that chemistry is not intimately associated with, but conducive to, successful mining; but when, as in the case before us, the teachings of that science are based upon a hypothesis questionable as to its general correctness, fitness, and adaptability of application, except in special instances, I may surely claim indulgence if I express dissent from the major propositions upon which the hypothesis reposes.

I wish it to be distinctly understood that I do not oppose my views to those of Dr. Phipson on the chemical conclusions he has arrived at, as I believe these to be correct; but to the assumptions, *a posteriori*, upon which the theory reposes as to the formation of gossan I wish to take exception. If I understand that position correctly, his assumption is that the decomposition of spathic iron is the origin of all gossans, I cannot see how this position can be maintained without assuming a number of other equally improbable and untenable positions, some of which must evidently be found—at least apparently—of a very contradictory character; one of which would be that large quantities of rich gossans occur on the backs of many lodes in which no spathic iron ore is found, either superficially or in depth; and, therefore, if such gossans proceeded from the decomposition of spathic iron ore, that metallic mineral must be of a decidedly superficial origin, and any analysis of which must fail entirely of one of two things. If it points to its origin, by inherent characteristics, determined by analysis, it must fail as an index of the composition of the lodes in depth of which it forms a part. It seems odd to hear one speaking of desulphurising metallic compounds by a natural process without assigning to the sulphur liberated by such a process some new association.

I have for a long series of years entertained the idea that gossan proceeded principally from the decomposition of sulphide of iron—mundic—and the oxydation of iron contained in the water near the surface, aided to some extent, in the case of copper lodes, by the decomposition of small quantities of copper pyrites, which are sometimes found shallow, both of which contain a larger percentage of iron than the carbonate of protoxide of iron, inasmuch as manganese and lime enter largely into its composition; but I had not the remotest idea, nor have I now, that the desulphurising of lead, copper, silver, or indeed of any other metal, was in any sense the origin of gossan. The desulphurisation of lead would probably result in minium, a red oxide of lead, and of copper in the black and red oxides of that metal; whilst the desulphurisation of silver would result, in all probability, in the native metal.

In nature I always understood that the desulphurising of one substance meant the mineralising of another, just as the decomposition of the nitrade of silver by means of the chloride of sodium means the formation of nitrade of soda and the chloride of silver. But in Nature's process of desulphurising metals no disposition seems to be made, according to Profs. Phipson and Silliman, of the liberated sulphur; but in the case of the decomposition of spathic iron ore the liberated carbonic acid is supposed by them to enter into combination with lead and form cerrusite, and no doubt the iron of which enters into combination with oxogen and forms gossan. The latter conclusion is undoubtedly correct, whilst the former, the desulphurising of metallic minerals, being the sole origin of gossan, is, I think, entirely fallacious.

I may betray an ignorance by no means flattering to myself when I confess I was not previously aware that spathic iron ore formed the matrix to any appreciable extent of our Cornish copper mines. It occurs more frequently, so far as I have been privileged to observe, as an associate of lead and silver (sulphides particularly), in the mines of the Liskeard and Callington district.

In the lead mines of Liskeard it is rather an exceptional than a prevailing mineral, but is the intimate associate of native and sulphide of silver whenever they occur at these mines. Wheal Trelawny. Wheal Mary Ann, Wheal Wrey, Wheal Ludcott, &c., were remarkable for their rich and abundant gossans—as much so as almost any copper mines in that county or elsewhere; and, whilst the sulphide of lead was found in comparatively large quantities within 3 ft. of the surface at most of these mines, carbonate of lead was exceedingly rare. An earthy carbonate of lead I have no recollection of ever seeing in connection with either of these mines, although I was officially connected with three of the four for a great number of years, and the other I knew intimately, having inspected it a great many times. It was only in the form of circular prisms or crystals that I ever saw carbonate of lead at either of these mines, although carbonate of lime, crystallised and otherwise, and the fluate of lime —fluor-spar—were the prevailing matrix. The quartzose portion of each of the lodes was of the class termed hornstone and chert, and was practically unproductive.

I regret that Dr. Phipson should have taken it for granted that the analysis of gossans for the purpose of ascertaining the probable prospective products of the lodes is an idea originating with himself. This is too palpable an injustice to the practical miner—through unintention on the part of Dr. Phipson, I have not the least doubt—to be allowed to germinate uncorrected. The practice of analysing gossan for the purpose of ascertaining what it contains and what it indicates has been common with some men for nearly a quarter of a century in relation to Cornish mining, to say nothing of our general practice of rigidly testing all vein matter in this locality.

Ellsworth, Nye County, Nevada, June 26. ROBERT KNAPP.

EMMA SILVER MINING COMPANY.

SIR,—I have just read your report, published in the Supplement to the Journal of June 1, of the special general meeting of the Emma Company, held on May 30, to receive Mr. Willyams's report of the mine after his recent visit thereto, accompanied by Prof. Silliman and others. I cannot but confess my surprise that Mr. Willyams should regard with comparative unconcern the proceedings of the Illinois Tunnel Company operating in ground belonging to the Emma Company; and flatter himself that that company entertained too friendly feelings towards the Emma Company to do them any harm. I have long since understood that friendship is never allowed to intervene in the relations and transactions of business men, at least in this part of the world; and, therefore, legal claims and not moral rights are what is most respected. Nothing is alleged in extenuation of their acts. It is not even said that the Illinois tunnel was projected with any other object than to intersect the Emma lode; nor is it said that that tunnel has not been driven within the limits of the Emma grant.

The inference from the Emma superintendent's remarks, as furnished by Mr. Willyams to the meeting, that he (the superintendent) thought there would be no difficulty in tracing a continuous connection between the two points, and not only the identity of the lode intersected by the Illinois Company with that owned by the Emma Company be proved, but that the Illinois Company's tunnel has been driven within the limits of the Emma grant. If this is not so, why speak of its being quietly given up by the former to the latter company? It surely cannot be accepted that the Illinois Company made that experiment purposely in the interests of the Emma Company, and to improve their property. Their tunnel, it is rather to be supposed, was projected in their own interests, and with the avowed object of increasing their own capital, and not for the purpose of spending their own money and displaying their judgment to enhance the value of the property of their neighbours, however strong might be their personal attachments or the bonds of friendship which subsisted between them. Friendship has merged into a conventualism whose modern significance it is difficult to determine, and its position in the social arena can only be assumed from data peculiar to parties and their circumstances.

If the tunnel of the Illinois Company is within the limits of the Emma grant, why defer the validity of the claim under that grant to the contingency of being able to trace the lode in one unbroken line from the Emma workings to those of the Illinois Company?

Every formal application for a United States patent for a mining property must be accompanied by a diagram or plan, showing its locality, its situation, and the direction of the lode or lodes contained therein, and the extent of ground on either side of the line of such lode or lodes, as allowed by law. It devolves on the surveyor to define the boundaries by setting up posts or monuments at the extremities thereof, descriptive of the objects they are intended to define. The included area within these limitations, when obtained by patent of the United States Government, is ratified by a consideration or money payment of $5 per acre, and a patent can only issue by compliance with this and other preliminary provisions. It is, therefore, clear that any and every intrusion by other parties within the included area of such boundaries must be deemed trespass, and should be restrained by service of injunction on the parties so trespassing, otherwise the United States Government is not supreme as a party of the first part to such contracts.

The United States grant in perpetuity a certain piece of land for a money consideration, which land contains, or is supposed to contain, a specific object or number of objects, with reference to which such grant is supposed to be made; this, in the case now under consideration, consists of a metalliferous lode or lodes sufficiently defined in nature, so far as seen, to be described as to character, size, dip, direction, &c. All these characteristics are known at the time of so describing them to be problematical—subject to change at any point or period in the future, yet at the same time it is necessary to assign specific boundaries to the objects to which they pertain, and this is done, but with the distinct understanding that the assigned boundaries are all subject to variation contingent on the course the lode may be found to assume when fully developed. But until such developments are made, and alterations in the original boundaries found to be necessary, the original boundary lines, it is fair to conclude, must constitute and define the rights conferred by such grants. It must, therefore, follow in a case of a lode bending or curving so as to cause its deflection longitudinally beyond the boundary lines on either side, originally supposed to be parallel with the lode itself, that it will be necessary to prove its identity to trace its continuity connectedly between the two points. But if this cannot be accomplished, then an adverse claimant to such a section of ground cannot but be considered to have the best of it, as the inference would be in nine cases out of ten from such discrepancies, whether apparent or real, that two lodes existed instead of one. ROBERT KNAPP.

Ellsworth, Nye County, Nevada, June 26.

MINING IN UTAH—CAMP FLOYD, AND EMMA MINES.

The following communication from Mr. Warren Hussey has been addressed to us through Mr. F. Bennett:—

SIR,—Learning that a party, other than Mr. Henry Sewell, has laid claims in London to being the originator of the Camp Floyd Mining Company scheme, I feel it to be my duty to address you on the subject, having had full knowledge of this transaction from its origin. The facts are these. About the end of June, I requested Mr. Sewell on his first trip to East Canon, to accompany me, and placing my carriage at his disposal we started for that district. My object was to have Mr. Sewell report upon the Sunny Side Mine, which I still own. *En route*, Mr. Sewell informed me he was going on to Camp Floyd to see a mine called the Sparrow Hawk, distant about four miles from the Sunny Side, he having seen a specimen of horn silver from that mine which had attracted his attention considerably, as he was certain that said specimen came from stratified limestone, in which formation he had had considerable experience in Chili, Peru, and Mexico, and that his object in going to Camp Floyd district was to procure some milling ore mines for his friends in London. Having pressing business in town I was forced to return, and left Mr. Sewell to carry on his explorations alone; besides, Camp Floyd district was at that time in a very bad odour, and held out no inducements to me. On his return to town Mr. Sewell informed me that in his opinion Camp Floyd was richer in milling ores than any district he had seen for years. He said that the Sparrow Hawk Mine was not sufficiently developed, but recommended it so highly that I was induced to watch its further development. Six weeks later, on a second visit to Utah, Mr. Sewell again spoke to me about Camp Floyd, and I then told him that I would take up the Sparrow Hawk and adjacent mines, entirely upon his recommendation, offering to pay down the amount of cash required to bond them, and whatever was necessary for sending an agent with them to London. He suggested Captain Shaw, to which I assented. I asked Mr. Sewell to see to getting these mines bonded in Captain Shaw's name, for two reasons.—First, because I could not leave my banking business to go to Europe.—Secondly, to avoid giving Captain Shaw a power of attorney to sell the mines, for such power not only causes delay, but difficulties arise that cannot be speedily overcome at this distance from Europe.

The time allowed by vendors here on the bonds of these mines was only four months. The casual circumstance of the bonds having been drawn in Capt. Shaw's name might make it appear that he was the originator of the enterprise, whereas he was simply employed as an agent in the matter, with an interest in the ultimate results. The owners of the Sparrow Hawk, Messrs. Lent, Hearst, and Miller, with whom Mr. Sewell had had conversation concerning the bonding of the mine (some time previous to any mention of Capt. Shaw's name), asked him if the bond which they were then about to execute was not in reality for me. Mr. Sewell informed them that it was, and I had promised on his recommendation to advance the funds for bonding, and also for sending Capt. Shaw to England. This satisfied them, and they arranged to get all the stock in their control, for the mine had been already stocked for the San Francisco market. While Mr. Sewell was at Austin, Nevada, Capt. Shaw was instructed to communicate with the above-named gentlemen, and ascertain what progress had been made in the collection of stock. As near as I can remember, four weeks had elapsed before the stock was all in. As my banking and other business required my attention, and it was impossible for me to attend to the details of this transaction, I authorised Mr. Sewell to act for me. This accounts for Capt. Shaw's letters and telegrams to Mr. Sewell, at Austin, Nevada, requesting him to return at once, and attend to the execution by Captain Shaw of a deed to me of two-thirds of the bond, which deed it was understood should be signed by Captain Shaw before I made any further advance of money.

I state these facts in justice to Mr. Sewell, who was the sole originator and chief promoter of the enterprise. The course pursued was fully decided upon before Mr. Sewell was much acquainted with Capt. Shaw. I paid out the sums necessary to bond the mines and defray Capt. Shaw's expenses to Europe, solely upon my faith in Mr. Sewell's judgment, ability, and integrity as a practical "mining expert," who had had many years experience in connection with mines in formations similar to those in the Camp Floyd mining district; and I repeat that when he called my attention to the great promise of the mines in this district, and especially to the ores in question, the district was generally neglected, and its mines had scarcely any position at all. I requested Mr. Sewell to give Capt. Shaw letters of recommendation to his London friends, as the captain had never been in Europe, and had no connections there with mining men; also to receive and answer all communications, and to give him instructions how to proceed in the placing of these mines upon the London market. In one of Capt. Shaw's letters he stated that he was following Mr. Sewell's instructions to the letter.

Placing a very high estimate upon Mr. Sewell's ability as a mining expert, Mr. T. W. Park and myself employed him, in July, 1871, to visit the Emma Mine, in which we were owners, and advise us as to the workings, new explorations, &c. I am happy to state that explorations since made, which were carried out as directed by Mr. Sewell, have enhanced the value of the mine immensely, thus proving the great value to us of his direction and experience. I say again that it gives me great pleasure to place Mr. Sewell all right on the records as the sole investigator and promoter of the enterprise which resulted in placing the Camp Floyd Mining Company (Limited) on the London market with such flattering prospects, and, as I verily believe, a most brilliant future. WARREN HUSSEY.

National Bank of Utah, Salt Lake City, April 13.

N. ENNOR'S REMARKS ON TIN AND THE TIN STAMPS, &c.

SIR,—I next turn to my Stamps. As an experiment, I have made about 10 models on different plans; I have shown them at the Jermyn-street School; the *Mining Journal* office; Harvey's Foundry, Nine Elms; and many leading engineers, mine agents, adventurers, and brokers in London. All have approved of my invention, and I firmly believe it must supersede the present stamps, as it must be known to Practicals who use the present stamps with a 4-ft. or a 4½-ft. crank, that it is nothing more than a lever of two to one against the heads and lifter; and under no circumstances could it do more than 1 lb. to lift 2 lb.; then comes the friction which is (in many stamps I have seen) nearly equal to the one gained. Then, the Messrs. Harvey say in their circular—"Cornish stamps can only be made to do from 50 to 60 lifts per minute." This, I contend, is giving the tin time to settle in the cover, and that makes more slime, and the tin goes off to sea. Again, Messrs. Harvey say they are "driving their compressed air stamps 150 falls per minute, not full three to one of the old stamps, and it does over ten times as much work. To me this goes to bear out my views that the old stamps is too ponderous and dead; it wants less weight and more life. With my stamps, and a portable engine, I can drive from 10 to 15 heads 100 blows per minute. This is a stamps that can be removed, and set to work again in three weeks; but it is immaterial to me as to the weight or the heads. My stamps will work any weight of heads; but I do believe that more life is required in the cover, and its doors should be thrown open to save tin.

I have one model with 10 heads—in all, 86 ozs. on a 2 ft. crank; on this it requires one-fifth to lift them, but on a 3-ft. crank 1-lb. lifts 7 lb. This is extra heavy heads on a 1-in. scale model; and if it will work these heads, over ½ lb. each on an inch scale, what is to prevent its doing so on a full scale? I have a 3-head old water stamps heads, ½ lb. each, and a 12-ft. (say) water-wheel. I have a 6-head stamps on my plan, all ½-lb. heads, with the 12-ft. wheel, and they will each work with the same weight; the proof line is wound round the wheel. All my models come to the same thing; but the most singular point is all these with the heavy heads are lifted with a less portion of weight—my friction is a mere nothing. I believe I have gained five grand points—first, I can lift my heads any height; second, I can drive them at any speed; third, I can save half the expense in erection; fourth, I can save six months in time of erecting; fifth, I can carry a 6-heads stamps, exclusive of heads on a single wagon, and drive them with a portable or horizontal engine.

If possible, in my next I shall go into the cost and time of erection; materials are so advanced that it is with difficulty I get prices from anyone. This may delay me for some time; but I am open to let anyone see my working models, and if they think fit to fix a small one to work by a portable engine, free of charge, I will attend the erection. I shall put one up on my own account shortly, when I hope my stamps and I will be more like life than some I have seen of late in my rounds. They commenced erecting a stamps in the summer of last year, and I have not heard it is at work yet; we must look over that, for if a man brings out a good thing I never like to tantalise him as to the time he was about it. The present stamps, with a 2-ft. crank, gains nothing by leverage. On my stamps, with a 2-ft. crank, it lifts 4, and gains 3; with a 3-ft. crank it lifts 7, and gains 6, minus friction, which is very little; then, if I work with a 2-ft. or 3-ft. crank, it is not equal to this one. N. ENNOR.

St. Teath, Camelford, Cornwall, July 16.

RESUSCITATION OF MINES IN CORNWALL.

SIR,—The high price of minerals is causing the resumption of many mines in this county, some of which never ought to have been abandoned. Doubtless a great quantity of tin will be found, which, when worked last time, although not sufficiently rich to take away, will now pay a very good profit, the enhanced price of tin being the cause; but I should strongly urge the necessity of making this a secondary matter, keeping in view the all-important object of sinking the mines below their present bottom into the second deposit. It was here that the great success of the Camborne district depended, and with what result can be seen on reference to the statistical accounts issued from Dolcoath, Carn Brea, and Tincroft Mines; and that there are many more such prizes to be found will depend entirely on deeper sinking, and I would strongly urge the desirability of employing capital to "making a mine under the old bottom," as the significant saying is in this county, when it will soon be found that Camborne is not alone, under similar circumstances, in her *deep* rich tin mines.

The once famous district of St. Austell has long been neglected, but I intend raising sufficient capital to further develope the resources of one of the greatest mines of that district—the Great Hewas Tin Mine, which worked probably for 100 years, and produced immense quantities of tin and large profits, and, strange to say, is only now 130 fms. from a shallow adit on one lode, while there are several others within the limits of the sett comparatively untouched, and like Camborne, and indeed every other rich district, there are the usual characteristics—viz., cross-courses and elvans. The greater part of the surface refuse has been carted away and stamped for the tin it contained, while at Polgooth, close by, and on the same channel of lodes, it has been found to pay well for the erection of steam stamping machinery for the reduction of the bur-

rows in that mine. Yet, during all the excitement for the last year, until now, this neighbourhood has been neglected, but I trust, ere long, by deeper sinking, to become the pioneer of another great and important tin district, nay, not second to any of the famed districts of the West.

I notice in the Calstock district the Drake Walls Mine is about to be wound-up; but I have not the slightest doubt, if sunk deeper, another and even richer deposit of tin than they have ever had will be found, and as the mine is well stocked in machinery, and also, what is more, an intelligent agent, a little further outlay to sink the mine deeper will probably lead to a lasting dividend property. With your kind permission, Mr. Editor, I will resume this subject in a week or two on some other mines. CHAS. BAWDEN.

St. Day, Scorrier, July 17.

EAST WHEAL BASSET.

SIR,—Since the last meeting of adventurers there has been sold 800*l.* worth of tin in the stone. About 7*l.* per ton of stuff was the exceptionally rich average of the quantity sold, whilst hundreds of tons of lower quality stuff (which is simply good stamping work) have accumulated on the floors awaiting the working of the new stamps. The underground resources of this mine are said by the most practical authorities to be surprising—in fact, not less so than its nearest neighbours—Wheal and West Basset Mines. The agent on the mine publicly announces that "the stamps cannot go to work too soon for them." The present position of this mine, with its certainly good prospects, must cause much satisfaction to the shareholders, who have shown considerable perseverance throughout the depression of mining, even at a time when this mine was thought nothing of, and as for prospects to have been barren. But the grand change is come, and the adventurers have reason to congratulate themselves on their present position, for nothing can be more satisfactory than the realisation of good sales (such as above), with a mine rapidly improving as it is being fairly developed.—*Truro, July* 15. W. S.

DOUGLAS HEAD MINING COMPANY (LIMITED).

SIR,—A paragraph in last Saturday's Journal speaks favourably of our Douglas Head property, and properly commenting upon the fact of our operations being interfered with by vexatious proceedings by the tenant of a field, part of which we occupy. The writer of these remarks is quite correct in what he says, except that, unfortunately for us, the W. and F. are not taking that interest in their welfare which we were led to believe they would, and which we are sure they should, although they are doing so in another case, in which they say the attendant circumstances suit their purposes better than ours. I am really obliged by the trouble your correspondent has taken, and, as I have not the faintest idea who he is, will, if you can give me his name and address, furnish him with facts which may soon, I fear, be of much interest to Crown lessees, and quite sufficient to again move his pen in their behalf.—*Liverpool, July* 18. WILLIAM C. BEW, Sec.

SOUTH AURORA MINING COMPANY.

SIR,—Perhaps the directors of the South Aurora Company will have no objection to publicly answer the following questions:—

1.—Whether that portion of the company's property called the Iceberg was subleased by them for a term of six months; and whether, since the publication of that news in the Journal, the agreement has been cancelled?

2.—To what extent it is true that valuable discoveries have been made in that and other property of the company?

3.—What has been the result of the prospecting, for which 50,000*l.* was returned by the vendors?

4.—What has become of the bullion that has been sent home since the last dividend, which, according to the printed returns of the directors, amounted to a sum almost sufficient to pay another?

These, Sir, are questions which shareholders have a right to have answered, and reticence on the part of the directors is only injurious to the company.

In conclusion, I would suggest to the shareholders whether it will not be advisable for some of us to call a meeting, to elicit the opinion of those interested as to the present state of the company and the conduct o the directors.

London, July 17. A PURCHASER OF BARCLAY'S ISSUE AT £10.

[For remainder of Original Correspondence see to-day's Journal.]

GREAT LAXEY.—The "Miners on Strike," in replying to the Circular of the Directors (published in last week's Journal), mention some matters which it may be as well to record:—

"The directors say that they 'have discovered just cause of complaint between the men and the managers, but the facts connected with these matters were known only by the managers and the men, and are proved by books that were never in possession of any director—the managers' measuring book, and miners' pass book."

"We found on examining our pass books, to get at an average of wages received for the past three months, ending June 7, that there was considerable sums of money paid each month to fictitious persons, who had no existence only on the pay sheet. Where this money goes to we cannot tell, but we know right well that no man working in the mines received any portion of it. If you, as shareholders, wish to examine these statements for yourselves, we give you the number of underground men of all sorts paid last pay but one, June 7—409 men—and the amount received was 1461*l.* 10*s.* 5*d.* Compare this for yourselves with the pay-sheet of that date, and you will there find the discrepancy."

"The directors seem to be grieved that we should presume to offer an opinion upon the surface improvements made by the directors out of capital, and to condemn the proceedings. They say—'This is surely a very ill-judged attempt on the part of servants to dictate to their employers how they shall conduct the affairs of the company.' If the whole of the shares in the Great Laxey Mining Company were owned by the directors alone, then it would have been presumtuous on our part to have said one word about the wasteful surface expenditure which has for some time been indulged in. They then would have had the right to have done what they thought proper with their own money; but we think (knowing that this money belongs to about 600 shareholders) that this 'wasteful expenditure' is a fair subject for public criticism; and when also, as we are led to believe, that the great body of shareholders never sanctioned this 'wasteful expenditure,' but that it was caused by the same 'unbending stubborn will that keeps us from our rights,' and so continues 'to close up your mine.' We cannot believe that the thousands spent upon the Ballacregga and Glenroy reservoirs, and the new machine and wheel, which are being erected for the sole purpose of clearing the new reservoir, was sanctioned by you, knowing at the time the amounts that would be required for the completion of these almost useless schemes of engineering folly; for at the most they will only be required for about six week or two months, during the extremely dry seasons. The same also may be said of the 'Glen tramway.' But what is the result after the 'bubble' has got fairly afloat? The simple fact is, that it costs now quite as much to convey the ores and blende down to the beach as it did before these thousands were spent (to say nothing of the wear and tear of wagons and tramroad); and it would have been just to as much advantage to the shareholders if this amount of money had been thrown into Laxey Bay!"

"The Laxey miners on strike 'deeply regret the course the directors have taken, and which is so injurious both to shareholders and ourselves, but we feel convinced that this event, apparently so unfortunate, will bring about very beneficial results, both to the company and ourselves.'"

PROTECTION OF WATER-PIPES IN MINES.—In our visit to the mines of the Comstock Lode, we found complaints of the manner in which iron water-pipes gave out under the biting touch of the vitriolic impurities of the moistures distilled from the crevices of the rock. Galvanising or coating with zinc gave practically no protection from corrosion, and, indeed, no available remedy was known. The same difficulty appears to be experienced in the mines in many parts of Europe; and in those of Siberia, where pyrites are common, the trouble is said to be now effectually avoided by a novel method of enamelling the internal surface of the pipes. The process involves a preliminary exposure of three hours to a bath of oil of vitriol—sulphuric acid. After this they are washed with water, and are brushed with a composition composed of 34 parts silica, 15 of borax, and 2 of soda, and are then placed in a retort at a dull red heat for about 10 minutes; this is the first coating. A second is laid on, composed of 34 parts of felspar, 19 of silica, 34 of borax, 16 of tin oxide, 4 of fluor-spar, 9 of soda, and 3 of nitre. This is melted to a mass in a crucible, then ground to a fine paste with water, and in this condition applied to the pipe, which done, the pipe is heated to a white heat, and maintained thereat for 20 minutes. This insures the perfect fixing of the enamel. Before the pipe has become wholly cool it receives an external application of coal tar, and is then ready for use. There seems no good reason why pipe treated in this manner should not prove well adapted for purposes for which, owing to its liability to corrosion, ordinary iron pipe is inadmissible.—*American Artizan.*

THE DEEPEST WELL IN THE WORLD.—Twenty miles from Berlin is situated the village of Sperenberg, noted for the deepest well that has ever been sunk. Owing to the presence of gypsum in the locality it occurred to the Government authorities in charge of the mines to attempt to obtain a supply of rock salt. With this end in view the sinking of a shaft or well 16 feet in diameter was commenced some five years ago, and at a depth of 280 feet the salt was reached. The boring was continued to a further depth of 960 feet, the diameter of this bore being reduced to about 13 in. The operations were subsequently prosecuted by the aid of steam until a depth of 4194 feet was attained. At this point the boring was discontinued, the borer or bit being still in the salt deposit, which thus exhibits the enormous thickness of 3907 feet. The boring would have been continued in order to discover what description of deposit lay under the salt but for the mechanical difficulties connected with the further prosecution of the operations. During the progress of this interesting work repeated and careful observations were made of the temperature at various depths. The results confirm very closely those which have been already arrived at under similar circumstances.

RAILROAD SIGNAL.—It is stated that a new danger signal has just been put in operation on a Massachusetts Railroad. The signal consists of a globe made of sections of red, green, and white glass, upon which figures from one to 15 are plainly marked, each figure denoting a minute. The signal is operated by the train, and moves back to the zero point when the locomotive goes by, and begins to involve when the last car passes. It then begins to move like a clock, and the figures which are visible through a single opening in the outside covering of the glass denote the time that has elapsed since the passage of the train. The figures can be readily seen in daytime, and at night the glass is illuminated by a light placed inside the globe. In this way the engineer of a rear train can ascertain the time that has elapsed since the passage of the forward train.

UTILISING WASTE SUBSTANCES.—Leather cuttings and scraps are, according to the invention of Messrs. GALE and BOYDEN, of Bristol, torn into shreds or ground into dust, then subjected to a solution of nitric, sulphuric, or other acid, and heated to make the mass glutinous, then washed in alkaline water and pure water, when it is again subjected to heat, adding glue or size prepared in acids or coal tar; thus heated the material is rolled or pressed into sheets, or the shreds or dust are mixed water and glue prepared with acid or coal tar. Before being dryed it may be used with paper pulp, also in making india-rubber, gutta percha, and parkaine, but it is particularly applicable for the soles of boots and shoes and floor-cloths. When vulcanised it is applicable to the purposes to which vulcanised india-rubber is applied.

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XLIII.—Having seen (continued Mr. SMYTH) that the employment of horses in the haulage of materials along the main roads of a colliery is by no means economical, besides being unequal to the great quantities of coal which are the daily output of the larger collieries, we will review some of the expedients used now-a-days. Mr. Nicholas Wood, whose name we have already quoted, made many experiments in order to discover the conditions under which rope-traction, or what is called the endless rope—or another device of the same kind, the tail-rope—can be applied for haulage along the main ways. The coal is usually worked from the main ways up the rise of the seam, and if the inclination be as much as 1 in 30, inclined planes (commonly called in some districts jig-brows or jenny-roads) come into use. By aid of a drum or sheave at the upper end, regulated by a brake, the loaded tubs run down with their own specific gravity and pull up the empty ones. This is an easily managed and very economical method, although for the avoidance of accidents it is needful to establish very strict discipline as to signalling when the train of tubs is about to be set running; and also to have side stalls, or refuges, cut out here and there for men to run into who may happen to be passing along the plane at the time. In well-managed collieries these inclines are fitted with substantial break-drums, wire ropes, and friction-rollers for the latter to run on. The descent, in some instances, is checked by a counterbalance tub suitably loaded, and the sheaves are arranged so that they can easily be moved forward as the workings advance. When the coal has to be brought upwards to the level it is usual to employ engine-power, either through the instrumentality of a rope passed from the surface down the pit, or by fixed underground engines worked by steam generated below, or compressed air. If the inclination of a down brow be not less than 1 in 28, the empty tubs in running down will drag out with them the rope from the drum of the fixed engine; but if it be less, they must be provided with a tail-rope passing round a sheave at the bottom of the incline, by which they can be hauled down again. If no arrangements of this kind are made the coal has to be brought up by the labour of men at windlasses, or by horses, and is thus very expensive. The proper use of inclines, on the contrary, is very inexpensive. At the Shireoaks colliery, near Worksop, Notts, a careful account is kept of all these details, and at one of these parts of the workings the following results were given: "Inclined plane of 800 yards long below pit bottom, gradient 1 in 50; train of 25 tubs at a time drawn at a speed of 8 to 10 miles per hour by a ⅝ steel-wire rope, stretched by a 4-ft. Fowler's clip drum, and worked by two 12-inch cylinders, 2-ft. stroke; average cost, calculated from 30,000 tons convey in six months, 1d. per ton, including wear and tear of rope, and all labour."

These methods, whether in "jig-brows" or "down-hills," have long been practised; but it is not many years since they came into use instead of horse-power for hauling the coals along the main-ways, which generally approximate to the horizontal. It is still only in the larger collieries, and those in which due care has been bestowed on the straightness (that is comparatively) and regularity of the roads that this improvement has been introduced; but its value may be inferred from the fact that in certain instances as many as 70 or 80 horses, with their drivers, stablemen, &c., are dispensed with, and that a small fixed engine actually hauls along a nearly level plane of a mile and a half in length, as at Seaton Delaval, trains of 50 to 100 tubs at a time, at an average speed of nine miles an hour. When there are curves in the direction, and undulations in the gradients, they must be met with a sufficiency of rollers and sheaves to protect the ropes from injury. But with these helps the train of wagons adapts itself, like a snake, to all sinuosities, and, with almost a complete immunity from accidents, lands its load safely at the shaft bottom, often after a journey of from six to ten miles. There are two systems which may be said to be rivals—the tail-rope and the endless chain. The first is in use at the Seaton Delaval Colliery and others in that district, while the latter is in vogue in North Lancashire. An attempt has been made to have the question of their respective merits fairly solved by a committee appointed by the Northern Institute of Mining Engineers, at Newcastle, who have published an important report on the subject. The endless chain is arranged to pass, without break, around a drum at each end, working without intermission or stoppage, and upon it are fastenings by which the wagons may be rapidly attached to it or detached from it. The chain then travels in opposite directions, one side towards the shaft, and the other from it. The advantages claimed for it are that as soon as a wagon is filled it can be attached, and away it goes, so that there is no waiting until a train can be made up. In the same way the empty wagons are passed along to the workings. This plan is not so well adapted for branch lines as the tail-rope, which can be worked with great facility in them. An endless rope is sometimes employed in the same way as an endless chain, in order to gain the advantage of using Fowler's Clip Pulley, a contrivance of great ingenuity. Its advantages are that the rope need only to be passed simply over the periphery of the wheel, instead of being coiled or wrapped round it, as on a drum; that it then holds the rope more equably and advantageously, without flattening the wires or grinding them against one another; and that it prevents a surging movement. The moveable clips on the circumference, which embrace the rope, clutch it so tightly that on a double incline one set of tubs may be thrown off by the breakage of the rope, and yet it is capable of sustaining the other. There is also this important difference between the two systems—one goes at a fast and the other at a slow speed, the latter, of course, greatly reducing the chances of accidents to the full wagons. This difference of speed in travelling makes but little difference in the amount of work done, as the endless chain is always travelling, while the tail-rope system works at intervals, when a sufficient number of wagons are ready. When the expense of the different methods is compared, the result has been given in this way:—

	Tons per working day.	Gradient.	Per ton.
TAIL ROPE.			
Seaham	522	1 in 64	1·948 of 1d.
Seaton Delaval	389	1 in 643	1·882 ,,
Harraton	586	1 in 83	1·515 ,,
Murton	407	1 in 183	2·172 ,,
ENDLESS CHAIN.			
Hopton Valley	372	1 in 178	1·830 of 1d.
Rowley (underground).	418	1 in 23	1·388 ,,
Rowley (surface)	403	1 in 68	·551 ,,
ENDLESS ROPE.			
Shireoaks	320	1 in 48	2·061 of 1d.

This shows but little difference in the cost of the two systems, but when compared with pulling by hand or horse-power the advantage is so great that these methods of engine traction are fast superseding all others.

It is interesting to know that in the United States they have succeeded in introducing locomotive engines underground for the conveyance of coal. In the district of Pennsylvania, where this has been done, some important comparisons have been made between the work of the locomotives and that of mules. The engines each weigh 11,000 lbs. with water and fuel, the wheels are 2 ft. in diameter, and the gauge 3 ft. 6 in., and it has been found that the expenses of the outlay required has been repaid by an enormous economy. It is, however, only under exceptional circumstances that this can be done. In this Pennsylvanian case they have an entrance to the mine by an adit level on a large scale.

Another mode of employing mechanical means of transit has been patented by a Mr. Hodson, called the wire-rope transport system, by which it is proposed to carry at a certain height from the ground a wire-rope similar to the endless rope, and have the wagons suspended on the lines. It does not appear, however, to have been carrred out successfully except under peculiar circumstances, of which we have no sort of experience, and it is said that when the gradients are high it is difficult to prevent the points of suspension from slipping.

Lastly must be mentioned another mode of conveyance, which was once thought likely to be a great improvement, but which of late years has almost entirely disappeared. In some mines where the adit was suitable it was proposed to construct canals, in which case the boats would pass outward to the daylight canals, and so to their destination with only once loading. This has been done in some instances here as well as abroad, where specimens yet remain, and very curious they are, being a connecting link, as it were, of our day with the times of those great civil engineers—Brindley, Smeeton, and others. Thus in Silesia there are two very remarkable instances where the levels being made of unusual size were filled with water, and the ore is conveyed from the workings in flat-bottomed boats. The motive-power is employed by means of a flat rope pulled at by a man, who stands or crouches in the bow of the boat. In our own country the most remarkable instance of this is to be found on the Duke of Bridgewater's estates, in Lancashire, where branches of the great canal system established there run into the mines for considerable distances, and are used for the conveyance of the ores and minerals into daylight. Another of these canals existed in the lead mines near the town of Holywell, in Flintshire, and a singular relic of olden times it is. There the level is of but small dimensions, and the space between the boats and the roof is extremely narrow, so as to offer no great inducement to would-be navigators to undertake so gloomy a voyage. The boatman lies on his back, and propels the vessel through these narrow passages by the action of his feet on the roof of the level.

UNDERGROUND HAULAGE—RUSSEL'S SYSTEM.—Mr. J. HENDRIE, proprietor of the Kirkwood Colliery, N.B., has adopted a system of haulage by wire-rope, suggested by his manager, Mr. Russell. This colliery is a recent experiment, which has proved eminently successful. The main coal and pyotshaw were found at the depth of about 40 fathoms, lying almost together, and only a very thin coating of fire-clay separating them, and being on an average 8 feet 3 inches in thickness. Twelve fathoms deeper the splint and gas coal were found in a somewhat similar position—the former seam measuring from 18 inches to 2 feet in thickness, while the latter most valuable commodity ranged from 3 feet 9 inches to 5 feet in thickness. Throughout workings of fully 2 miles in extent, manual and horse labour are almost entirely dispensed with, through the application of an endless wire-rope, which is very ingeniously adapted to work the various levels, and draw the coal from the face, where the splint and gas coal are being got to the bottom of the shaft of No. 2 pit at a depth of about 360 feet. From the top of the shaft a wire-rope of three-quarters of an inch in diameter is passed round two horizontal drums of 11 feet and 6 feet respectively in diameter. This rope is passed three times round the large drum and twice round the smaller, after which it runs over the top of two vertical drums about 7½ feet in diameter, and is thence conveyed to the bottom of the shaft, a depth of 60 fms. Here the rope is again passed round two vertical wheels, similar to those at the top of the shaft, and then runs into the main working for at least 600 fathoms. Less than midway along this working the rope is made to branch off at a right angle, to work a "dook" at present being run in that direction. At the far end of the working, by a very simple yet ingenious contrivance, all the effects of any sudden strain upon the rope, or any accidental or even malicious breakage of the rope, are guarded against or rendered nugatory. A moveable carriage is attached to a back balance, and the moment any extra strain comes upon the rope the carriage moves, and causes the back balance at the regulating wheel, which is placed at the centre of the working, to sink, and thus the rope is immediately thrown off, which at once attracts the attention of the engine-keeper at the top of the shaft, and the machinery is then brought to a standstill. The centre wheel has also the important advantage of taking up the slack of the rope when this occurs through a heavy load being suddenly brought to bear upon the rope at any place of the workings. "Bogies," small boxes upon wheels, run along this underground line. The novel method in which the brake is attached to the over-running rope attracts attention. On the bottom of the driving carriage a groove is made, into which a running rope is drawn by a hook carried by the driver. But the attachment is not complete until the counterpart part of the groove is pressed firmly down on the running rope by a simple brake or screw movement, when immediately the bogie is in motion a single turn of the brake handle and the rope is free, and the truck at a standstill. At a distance of 12 fathoms up the shaft is the seam of the main coal. The return rope here ascends the shaft, and passes over a pair of vertical wheels, and also runs through the whole working and back—a double line of rails being laid between the two shafts. This working is attended with considerable difficulty, from the fact that it is wholly a rise working to the bottom of shaft No. 3. It is all wrought upon the dook system, and the whole of the coal is taken up the rise to the bottom of No. 3 pit. We thus pass along 70 fathoms of an almost level cutting, after which we come to a heavy incline of fully 100 fathoms in length, the rise upon which is fully 80 feet; coming down the hill in the empty bogies, it is wonderful how easy it is to throw off the rope and shunt to the side line in order to pass a dook from a higher level, by the simple process of grappling and unloosening the rope already described. The saving effected by this method of haulage is very considerable, being estimated as at least equal to 3d. per ton. The machinery and appliances at Kirkwood cost originally something like 400*l.* During the first year's operation with the wire-rope system, the original expense was cleared off, and further profits realised.—*Mechanics' Magazine.*

THE SCREENING AND TRANSPORT OF COAL.

With a view to furnish those interested in the development of the Indian coal fields with a knowledge of the practice of British coal-masters in connection with the screening and transport, a report upon the subject has been prepared by Mr. F. C. DANVERS, and printed by order of the Secretary of State for India in Council. As the title indicates, the information given refers exclusively to screening and transport; and as the time at Mr. Danvers, disposal for making the compilation was limited, he has been compelled to restrict his investigations to Northumberland and South Wales. He believes the practice of screening to the extent to which it is adopted in South Wales is particularly destructive; and it is a somewhat curious fact that whereas the steam coal of South Wales has to undergo numerous screenings, that of the Newcastle district, which would not suffer so much from the process is, as a rule, scarcely screened at all. This question of screening is an important one for India, where much of the coal is of a very soft character. The paper contains numerous cleverly selected extracts from papers by practical men, read before such societies as the South Wales Institute of Engineers, Ure's Dictionary, &c., and the reprint of a paper from the "Quarterly Journal of Science;" and will be found useful to those about to connect themselves with coliery operations. There are some admirably executed lithographs of iron and of wooden trams used in South Wales and in Sunderland; of the ordinary colliery screen, with easing chute, used in the South Wales district; of the improved balance screen at Blaingwawr; of the ordinary Newcastle screen; and of an apparatus for double-screening small coal. Mr. Danvers describes Poupard's screen as being cast in one piece, so that in the event of a breakage taking place the whole screen has to be removed, and a new one put in. This is an absolutely incorrect description of Poupard's screen, the great merit of which is that each bar is separate, and that the size of the slots can be varied at pleasure. A sketch is given of a portable screening apparatus, but this really has the objectionable feature of a screen cast in one piece.

With regard to the shipment of coal, Mr. Danvers states that shipment of coal in the widest sense of the word is not likely to attain any great magnitude in India for many years to come, but where coal is conveyed by canal or river the shipment of coal may have to be resorted to in many localities where railway accommodation is wanting, whilst the means of water carriage is available. Some drawings are given of objectionable arrangements which have been adopted for emptying coal trucks, and the defects indicated. In India, where coal mining is in its infancy, the report may, perhaps, be turned to some account, but we believe that most practical men in this country will agree that the writer has extremely little knowledge of the subject of which he treats, and that most of the best forms of apparatus have been ignored, probably from Mr. Danvers never having seen or heard of them; reference, however, is made to Nixon's coal-tipping apparatus. Only one or two of the inventions for compressing small coal are referred to, and we fail to find any notice of those which have been in successful operation for years. The book is not unreadable, but the information must be regarded as very incomplete and exceedingly unrealiable, an opinion which we much regret is the only one that can reasonably be pronounced.

NEW COAL CUTTING MACHINES.

The coal-cutting machine, as perfected by the Messrs. Baird, of Gartsherrie, after many years of anxious labour, and chiefly through the exertions of Mr. Wm. Stevenson, assistant underground manager, possesses all the advantages over the usual method of hand labour, as it is a great economiser of time and money, every ton of coal being produced much speedier and at a smaller cost. The danger is also much lessened, as the number of men employed in every pit where the steam collier is adopted will be comparatively limited.

Through the kindness of Mr. Stevenson, who accompanied us during our visit to the pit, we were speedily attired in the full rig of the miner, and with lamp stuck in bonnet we prepared to descend the shaft. Before doing so, however, an examination of the compressed air engines was made. These consist of a pair of 16-in. horizontal engines, with air cylinders to match, for the purpose of generating the compressed air for driving the machines. The compressed air is carried from the cylinders to a large receiver, whence it passes down the shaft in cast-iron pipes of 5 in. in diameter, and is by the same method carried along the main road to the machines, which are situated at the face, fully 300 fathoms distant from the pit bottom. This main roadway did not present any serious obstacle to our onward path, as, beyond a little stooping down to free our head from coming in contact with the roof, and keeping a sharp look-out ahead, we contrived to follow the lead pretty tolerably; but when we came to enter the heading, the roof of which was only about 3 feet in height, it was then that we felt our collier's legs wanting. Midway along the main shaft, at the entrance to this heading, the air is led into another receiver, where the condensed water is withdrawn from the compressed air. This is necessary at this stage of the process in order to prevent any interruption from the exhaust of the machines getting choked with ice. It may not be generally known, but this was one of the great difficulties to be overcome in perfecting the coal-cutting machine, because where compressed air is used as a motive-power the exhaust invariably gets choked up with ice. But this has been most effectually removed by the erection of a condenser or receiver at this portion of the mine.

Passing up the heading, then we come into another roadway, where we can venture to raise ourselves partially from the double position we have been in for some time, and were we are suddenly startled by the strange sounds that fall upon our ears, and are told by our guide that this is the collier at work. A few minutes more and we begin to see the flicker of the miners' lamps through the darkness, and are almost immediately afterwards standing by the side of the steam collier in full play at the face.

The machine is worked at a pressure of 45 lbs. to the square inch. It may be said generally to consist of a cast-iron frame 6 ft. by 2½ ft., from one side of which is distended a horizontal jib. Round this jib passes an endless chain, upon which are fixed the strong steel cutters, somewhat on the principle of the teeth of a circular saw. These cutters are nine in number, and are pressed forward into the coal when the cutting is about to be commenced by the distended jib. This endless chain, again, is driven by a chain wheel on an upright shaft, which is connected with the crank shaft of an engine by a series of spur and bevel wheels. The rotary motion to this crank shaft is given by an ordinary horizontal engine with an 8½-in. cylinder and a 12-in. stroke, which is attached to the framework of the machine. The machine is geared in the proportion of 10¾ to 1—that is to say, 10¾ revolutions of crank of engine are equal to one revolution of chain wheel. The forward motion to machine along the coal face (for it is self-propelling) is given by an eccentric cast on the bevel wheel, which is fixed on the upright shaft referred to at first. The straps of this eccentric are connected to a lever which drives a ratchet wheel, on the shaft of which wheel is the propelling drum, round which the chain which draws the machine forward is wound, the other end of this chain being made fast to a fixed tree in front of machine.

The machine having been got into position, and the india-rubber hose-pipes—which conveys the compressed air from the main iron pipes to the machine—being attached, and the road laid, the air is turned on, and the cutting commences. With a noise somewhat frightful to the uninitiated, the endless chain with the distended jib moves slowly out of sight under the coal, cutting at the rate of 1 foot per minute, or 60 feet per hour—the actual or working speed, including occasional stoppages, throughout the whole shaft, averaging 45 feet per hour, while it holes into the coal to the extent of 2 feet 9 in. or 3 feet, as wanted. The machine is attended by two men only, the driver and his assistant. The latter lifts the rails as the machine advances, throws them on to the cover of the machine, whence the driver lifts them, and re-lays them in front. The road along which the machine travels is made of cast malleable rails of simple construction, and which possess the advantage of being lifted and re-laid with the utmost facility as the process of cutting is going on. One end of the sleeper butts against the coal, whilst the other is held by the rubbish of the mine, which gives a most rigid, secure, and safe road. The whole of the machinery is enclosed in a neat and strong cover of iron, which keeps the men thoroughly protected while the machine is at work.

At one time the estimate of work expected by the inventors of this machine was laughed at as altogether illusory, but experience has completely dispelled this idea, as also that of the great expense of keeping the machines in working order. The machines are now doing fully one-half more than was expected, at a considerably cheaper rate per ton, and this altogether independent of greater safety and better production. The work being performed by each machine is 350 feet per shift of eight hours, which yields about 75 tons of coal, equal to the work of 30 men in the same period. By the adoption of these machines the most laborious portion of the miner's work is not only entirely dispensed with, but there is also far less destruction of the coal itself in the shape of dross. This is no small matter in itself when the increasing consumption of fuel, in every branch of industry, gives a stronger argument for economy being used in this great originator of motive power. The seam of coal in which the machines are at work is called the "Virtuewell." It is an exceedingly hard coal, 2 feet 10 in. thick, with a clay above it varying from 10 in. to 18 in. in thickness.

The machines work entirely by night, and relays of men and boys remove the coal cut by the machines during the day, and also prepare the line of "face" for the next evening's work. Great safety is ensured by this method of dividing the labour, the coal being got out rapidly and fresh roof entered into every day. Blasting is also dispensed with, the coal breaking off by its own weight from the straightness of the face and the extent holed.

The system upon which the seam is laid out for the working of the machine is called a backward system—that is to say, a main heading having been driven to the rise of the pit level, other levels are driven off this at a distance of 100 feet from each other. These levels are 60 fathoms long, and from this point the coal is wrought backwards to the main heading. The working line of face is kept open by a course of buildings. The material for these buildings is obtained from the clay overlying

the coal, and which is brought down when the coal is dug out. A large number of cast-iron trees are also used, which add much to the safety of the workmen; and as these are used over and over again, become in the end much cheaper than wooden ones. The roads by this system are all on the solid, and although there is certainly a first cost for mining, this is more than compensated by all brushing being dispensed with.

The proprietors, being now thoroughly satisfied with the latest design of machine, have ordered from the makers of the first one—Messrs. Miller and Anderson, of the Vulcan Foundry, Coatbridge—six more of the same pattern. One of these six machines, already contracted for, and which are expected to be working next month, is going to Hetton Colliery, in the North of England. The introduction of the machine into this colliery is anxiously looked forward to by the English masters, in consequence of the present great scarcity of mining labour.—*Glasgow Herald.*

MANUFACTURE OF STEEL.

The necessity for possessing a knowledge of the progress made in other countries in order to be enabled to maintain our position in our own daily becomes more apparent, and especially so in a branch of industry wherein such important improvements are constantly being made as in the manufacture of steel. The value, therefore, of such treatises as those of Prof. Grüner can scarcely be over estimated; but, since it is not every practical steel manufacturer who can understand a technical treatise in the French language, the want of a reliable translation has been much felt, and now that this has been supplied by Mr. Lenox Smith,* a large number of those connected with the iron and steel manufacture, whether in England or the United States, will, doubtless, gladly avail themselves of it, since with the additions which have been made by the translator the work really represents a "careful, elaborate, and, at the same time, practical, investigation of the physical properties of steel, as well as a description of the new processes and mechanical appliances for its manufacture." The excellence of Mr. Grüner's treatises —"De l'acier et de sa fabrication" and "Examen du Procédé Heaton" was noticed in the *Mining Journal* at the time of their publication, and the present translation affords an opportunity for referring to a few of the more prominent points somewhat more fully. Experience proves, it is remarked, that cast and wrought iron can be obtained with any ore of iron, but that the cast and wrought iron produced have various properties, because of the greater or less purity of the ores, and because the methods of treatment do not all effect the elimination of foreign substances to an equal degree.

The distinctions between the various kinds of iron and steel are very well defined. The crude cast product resulting from the reduction of the ores of iron may be called pig-iron. It is an impure iron, which is not malleable, at least when heated, which may be tempered by being suddenly cooled. The name wrought-iron is given to a metal more or less refined, obtained from pig-iron or in the direct way from iron ores. It is malleable hot and cold, but not capable of being tempered. The practical man will call every intermediate product steel which may be tempered, but which remains malleable hot and cold when not tempered, and this metal will be steel whatever be the method followed to obtain it—direct extraction from the ore, partial fining of pig-iron, or recarburation of cast-iron, it cannot be said where steel begins or ends. Cast-iron passes into hard steel in becoming malleable, and steel, properly so called, passes into iron, giving in succession mild steel, steel of the nature of iron, steely iron, and granular iron; and these transitions are observed not only when we compare the property of the products, and their mode of manufacture, but also their chemical composition. Doubtless it is very difficult, even impossible, to prescribe exact limits to the composition of cast-irons, steels, and wrought-irons; but, after all, that which distinguishes the three products is solely the relative proportions of carbon, of which a portion is simply mingled with the iron, the remainder intimately combined with it, or rather in a state of solution. We find it strange that some tenths of a per cent. of carbon can modify iron so as to cause it to pass into steel. Numerous analyses are given to show the effect of various ingredients upon the product.

With regard to the Bessemer process, it is remarked that it is now widely disseminated throughout all countries, and some very valuable tables are given, showing the great uniformity of the product. The Orleans Company before deciding in favour of rails made entirely of Bessemer steel required two series of tests to be made to prove the uniformity of manufacture. Two ingots from the same cast were to be submitted to similar tests, and it was to be shown that the results were practically identical. The same test was to be repeated with three different casts. The conditions of the test were—a standard cast was to be made, from which an ingot should be chosen to which the test just stated was to be applied; six casts were to be made in order to arrive at the same standard; an ingot was to be taken from each cast, and the same results were to be attained by the ingot from the standard cast. These ingots were rolled into rails in the usual manner, and each rail was subjected to tests for deflection and permanent set, and also to shock. The results were most satisfactory. The first series of tests clearly shows the practical identity of two ingots taken at random from the same cast, and the regularity of results up to 25 tons weight, which represents nearly the limits of elasticity, is especially remarkable. It may even be said that the differences are much less relatively to the weights sustained when the elastic limit is exceeded. This series of tests was not made to show that the casts were identical, but a remarkable regularity is, nevertheless, shown. The second series of tests shows the practical identity of the six casts; the differences in a permanent set approach some tenths of a millimetre. It is only when the limits of elasticity is exceeded that the difference becomes a little greater. The shock tests show remarkable regularity; the results harmonise perfectly with those of the pressure tests.

The working of the Bessemer process in England, Sweden, Austria, Belgium and Germany, Russia and Italy having been fully referred to, there is a chapter on the defects of the process, and the means of remedying them; after which Berard's process, fining by reaction; the Martin process at Sivenil, and the manufacture of refined cast iron are in turn referred to. The methods founded on cementation are dealt with in a very complete and systematic manner, the general outline of the process being followed by descriptions of ordinary cementation, cementation and simultaneous fusion in crucibles, and double fining, or the Parry process. There are also very ample details of the method of Prof. Eggertz, of Fahlun, for the determination of carbons in steels, and of his method for the determination of the sulphur in steels and pig-irons, and, by way of appendix, Mr. Smith has given a very interesting account of the Bessemer progress as carried on in America, a subject with which Prof. Grüner had little, if any, acquaintance.

In its extended form the book gives as complete an account of the manufacture of steel as any practical man need wish for; an acquaintance with its contents will give him increased facilities for conducting his business with success, by enabling him to discover defects in the process, and suggest remedies likely to remove them; and, as the style is clear, concise, and readily intelligible to those whose studies have been carried on exclusively in the works, it has everything to recommend it. Comparing the translation with the original, there can be no hesitation in stating that the task has been admirably performed throughout, the author's language having been very closely followed, although all trace of the foreign idiom in the translation has been carefully eliminated.

* "The Manufacture of Steel." By M. L. GRUNER. Translated from the French by Lenox Smith, M.A., M.E. With an Appendix on the Bessemer Process in the United States. By the Translator. New York: D. Van Nostrand.

THE LIFE OF RICHARD TREVITHICK.

The whole world is so much indebted for its material progress to the steam-engine that the biographies of those connected with its early history are always interesting to all classes of readers; and, as RICHARD TREVITHICK is amongst the earliest inventors in this direction, an account of his life will be particularly acceptable. A very readable volume under the above title has just been completed by Mr. FRANCIS TREVITHICK, C.E.,* embracing all that is known of of Trevithick up to the date of his preparations for leaving Europe for South America. Referring to the early Cornish engines, the author remarks that the open launder of the tin streamer had been converted into a close launder or pipe, having a square leather bag attached to a long wooden handle, serving as a bucket in the primitive hand-pump: but increased depths overtaxed the strength of the square-sided pump, and cylindrical wooden pumps were made, bound by iron bands. The rag and chain pump then came into use, being a revolving or endless chain, moving upwards through the pump, having at every 2 ft. or 3 ft. of its length a piston, made of a ball of rags bound together, or of wood edged with cloth or leather, for up to this time valves had not been used. The observed fact that water would rise to a certain height in a pump following a well-constructed piston suggested the use of a bottom or stop valve, preventing the descent of the water, and also the use of a valve in the piston or bucket. In 1663, the Marquis of Worcester applied steam to force water up a pipe; other inventive men varied the methods, and even constructed model steam-engines, but failed to help the miner.

Savery's engine is considered by Mr. Francis Trevithick to have illustrated three leading principles of the modern steam-engine—the use of steam to expel the atmosphere, its condensation by cold forming a vacuum, and the more direct use of steam as a strongly expansive manageable agent. How far these constitute the leading principles of modern steam-engines engineers will readily understand. Savery's engine, requiring to be fixed near the bottom of the shaft or within 30 ft. of the level of the water to be raised never, he says, came into general use; absence of moving parts made it unsuitable for any other purpose than the raising of water, and even for that there are not many traces of its practical application. The Newcomen engine is fully referred to, and there are good illustrations of the Newcomen atmospheric engine at Pool Mine in 1746, and of the stamping and washing arrangements in use there. In 1746, he continues, the Cornish pumping-engine worked 15 strokes a minute, and was so under control from its well-contrived gear and valve-work that the engine regulated its own movements, and its power was only limited by the diameter of the cylinder and the strength of the steam. In 1758 Borlase wrote that several methods had been suggested for increasing the elasticity of the steam, and reducing the size of the boiler, and it appears that shortly after that period Richard Trevithick, sen., took the first step in overcoming the difficulty.

With regard to the pedigree of Trevithick, it is shown that he was not a descendant of the Trevithicks of Trevimider, but of some poor branch of the family, whence they descended, and it is shown that in 1760 Richard Trevithick, sen., married Miss Anne Teague, whose family were mine managers in Redruth district. With regard to the younger Trevithick's genius, it is urged that it was really he who in 1804 introduced the steam-blast, and this certainly seems to have been justified by the fact that he wrote that "the steam is delivered into the chimney above the damper; it makes the draught much stronger by going up the chimney." No pains appear to have been spared in collecting every item of useful information bearing upon the subject, and the volume altogether forms as careful a biography as could be wished for.

* "Life of Richard Trevithick, with an Account of his Inventions." By FRANCIS TREVITHICK, C.E. London: E. and F. N. Spon, Charing Cross.

THE COAL FIELDS OF AUSTRALIA.

The Victorian Coal Fields Board have just issued their final report on the coal fields of the south-eastern part of the colony, embracing plans, sections, and diagrams, and an account of the physical character and the geological structure of the Western Port and Cape Patterson Coal Fields. They have diligently sought to gain information which would throw some light on the age of the rocks in which seams of coal occur in Victoria, with the view principally of comparing them, as coal-yielding strata, with rocks of a similar age in other countries where the coal intercalated with them is of economic value. The greater part of Victoria is occupied by granites, crystalline schists, upper and lower silurians, upper palæozoic and mesozoic rocks, basaltic and volcanic rocks, and marine tertiaries. These several formations are in many parts overlaid by basaltic and volcanic rocks, and by drifts and alluviums, and it is not easy to determine the boundaries of them with any degree of accuracy. In Gippsland only, as far as they have been able to ascertain, are found rocks of undoubted Devonian age. From the Buchan limestones Prof. McCoy has obtained abundance of spirifera lævicostata, placodermatous fish, and characteristic fossils, the former perfectly identical with specimens from the European Devonian limestones of the Eifel. At Tabberabera, where the River Wentworth unites with the River Mitchell, Mr. A. Howitt has collected from the limestone a great number of fossils of Middle Devonian age, and still further westward, in the bed of the River Thompson, Mr. John Ferres has obtained brachiopods and other fossils having a Devonian facies, also from limestone beds. It is probable, therefore, but certainly not yet proven, that the Devonian limestone underlies the great area of upper palaeozoic rocks in South Gippsland.

The upper palaeozoic rocks occupy a large area—more than 3500 square miles in the aggregate—and they at one time undoubtedly covered all the silurian rocks from the River Murray southwards to the sea coast. The two largest patches lie far apart—one on the westward, on the Glenelg, and the other to the eastward in South Gippsland. Numerous smaller patches are left standing at various intermediate points, indicating the connection which existed in former times. As regards the age of these beds, which are not known to yield coal in any part, there are doubts. Good specimens of lepidodendron have been collected in the area occupied by the upper palæozoic rocks in Gippsland, but "other fossil plants characteristic of the English coal strata" the Board have not been able to trace. Prof. McCoy, however, believes that these rocks belong to the true carboniferous period. The Board naturally incline rather to adopt the opinion of Prof. McCoy, based on palæontological evidence of the clearest kind, than to suggest that the lepidodendron beds are older than the Devonian limestones. It is, however, right to state that the Rev. W. B. Clarke believes that these rocks do underlie the limestone beds. Large areas, classed by the Board for more convenient reference as of upper palæozoic age, are believed by Prof. McCoy to be lower mesozoic. The lithological character of these rocks is well marked. Coarse and fine grained sandstones, from nearly pure white to dark red and purple, shales with plates of mica, coarse conglomerates containing fragments of granite of various colours and texture, rounded masses of porphyry and other plutonic rocks, crystalline schists and sandstones, and blocks of quartz are found to compose the mass of them. In many places thick even-bedded sandstones are found. The aggregate thickness of the beds has not been determined. In some localities, where this formation is bounded by silurian rocks, rich gold workings have been discovered. In the shales containing impressions of plants no trace of true coal has as yet been discovered. The strata in which coal seams occur in the districts of Cape Patterson, Bellarine, Geelong, Cape Otway, and Wannon are undobutedly of mesozoic age, but they do not all occupy the same position in the series. The plants are well-marked species, pecopteris, sphaenopteris and neuropteris, a taeniopteris, and a phyllotheca. Plants, characteristic of the European coal beds are absent. They have nowhere discovered any fossil flora, though a diligent search was made for such remains in all the beds seen in the section of the Cape Patterson district. Prof. McCoy has examined a species of unio found in the Wannon district, which he has named "unio dacombii." It has not yet been found in the eastern districts.

From the evidence before them, the Board are compelled to believe that the thick and valuable seams of coal which are now worked in New South Wales are of mesozoic (Jurassic?) age, and that the seams now unworked, underlying or intercalated with the lepidodendron beds, are of the same size as the so-called upper palaeozoic rocks of Victoria. The mesozoic rocks are largely developed in Tasmania; they occupy many extensive areas, and good and thick seams of coal occur in them; but up to the present time, though many efforts have been made at great cost to develope them, they have not been worked successfully. In the basin of the Douglas river, and on the Derwent, there are seams of coal said to be 8 ft. in thickness, and in other parts there are seams of good and slaty coal exceeding 20 inches in thickness. As to the geological age of the beds, Prof. McCoy says that from the identity in the plant beds associated with the coal of the Jerusalem basin, and those of the Newcastle, he has no doubt of the age of both being mesozoic, and this is further borne out, and a connection established with the Ballarine beds near Queenscliff, by the pecopteris australis having been recognised by Prof. McCoy in these latter deposits as in the Tasmanian ones, thus carrying to the latter the additional mesozoic evidence of the zamites barklyi and other species of cycadeaceous plants found in the Victorian locality. Prof. McCoy considers the Australian and Tasmanian pecopteris australis cannot be specifically separated from the Scarborough species, and is scarcely even a recognised variety. In New Zealand no coal seams have yet been discovered that can be referred to palaeozoic coal measures, such as occur in the northern hemisphere, as all the formations which contain workable seams belong to the secondary or mesozoic, and to the tertiary or camozoic epochs. The anhydrous coals, which are found in a formation extending from the Grey river to Cape Farewell, are likely to be extensively used in steam vessels. At the Grey river the coal extends over an area about 15 miles in length by 6 miles in width. The seams occur in such a manner as to admit of their being worked at a small cost, as neither shafts nor pumping machinery will be required. There are four workable seams, the main seam being 15 ft. 3 in. in thickness. In the immediate neighbourhood of the Buller river there are workable seams extending over an area of 15 square miles; there is a total thickness of 38 ft. of pure coal in this area, and the quantity available in one locality has been estimated at 200,000,000 tons. Mr. Trickett, chief engineer of Woolwich Dockyard, certifies that the evaporative power is equal to the average of that of North of England coal. The age of the formation is the same as that of the coal fields of New South Wales.

The coal beds of China appear to be geologically of the same age as the Victorian, New South Wales, Tasmanian, and New Zealand beds. The coal strata rest on Devonian limestones, and the plants found in the shales have been identified by Prof. Newberry as those characteristic of rocks of triassic or jurassic age; he has noted the the presence of well-marked cycads, species of podozamites and pterozamites closely allied to those found in Europe and America. There is, he observes, an entire absence of phyllotheca, glossopteris, &c.; but pecopteris sphaenopteris, podozamites, &c., have a familiar look, and give fresh evidence of the monotony of the vegetation of the globe previous to the introduction of the angiospermous forests of the cretaceous epoch. There are two seams of coal in the Tatsau Mine, anthracite, one from 23 to 35 feet in thickness, and the other separated from the former by 8 feet of sandstone, from 7 to 18 feet in thickness. Geologists, continues Prof. Newberry will not fail to be deeply interested in the fact that such large portions of the coal basins of China, including beds of both anthracite and bituminous coal—worked for hundreds of years, probably the oldest coal mines in the world—are wholly excluded from the carboniferous formation. So large is this coal-bearing area indeed, that when joined to the triassic, cretaceous, and tertiary coals of North America they quite overshadow the carboniferous coals of Europe and the Mississippi Valley, and suggest the question whether the name given to the formation, which includes the most important European strata, has not been somewhat hastily chosen. The Káranpúra coal fields, where the area occupied by the coal measure is 544 square miles, and the available coal derivable from thick and good seams is not less than 8,835,000,000, is considered by Mr. T. Hughes to belong to the trias, or a period perhaps later. He has found such plants as glossopteris, taeniopteris, and priessleria. Associated with the remains are labyrinthodout and dicynodout remains, the latter significant of the poikilitic group in India, Africa, and Europe. The Indian beds of Rajmahal are also supposed to be of mesozoic age. Exactly as in the English beds, the glossopteris is associated with taeniopteris. The latter fossil is found abundantly in the Cape Patterson and other coal beds in Victoria with pecopteris, sphaenopteris, &c., and it is scarcely reasonable, therefore, to regard the glossopteris as other than a mesozoic fossil.

The coal measures of Richmond, Virginia, are stated by Sir C. Lyell to belong to the lower part of the jurassic group. One of the ferns, pecopteris whitbiensis, found in this field is a species common to the Yorkshire oolites. The main seam is in some places as thick or thicker than any in the New South Wales coal fields. In some places it is from 30 to 40 feet in thickness. From the evidence they have collected the Board are of opinion that the coal beds of Victoria, Tasmania, New South Wales, and New Zealand are of mesozoic age. There are beds of coal of palaeozoic age in New South Wales and probably also in Victoria, but the seams to which the Board have referred belong to altogether a later period. The large areas occupied by upper palaeozoic rocks in Victoria have never been explored for coal, and it would be rash, therefore, to state that no seams exist in what are known as the lepidodendron beds. It is generally found that in any series of rocks containing seams of coal the best and thickest seams lie in one part only of the series—that is to say, there are usually strata of greater or lesser thickness lying over or under the part where workable seams occur of the same geological age as the coal, and though seams of coal may alternate with these strata they are rarely of eccnomic value.

Then, regarding the coal-bearing rocks of New South Wales and Victoria as belonging to one period and forming one series, we should, it is remarked, enquire what position the beds at Cape Patterson occupy in the series. After considering all the facts, the Board agree with Mr. Selwyn that the Victorian series are newer than and above the Sydney sandstone, and may represent the Wyanamatta beds of Mr. Clarke. It is probable that the Victorian beds are somewhat lower in the series than the Wyanamatta beds, and that the gangamopteris beds of Bacchus Marsh are nearly the equivalents of the Sydney sandstone. If this view be correct, it is not likely that seams of coal as thick and as persistent as those occurring in the lower mesozoic beds of New South Wales will be found in any part of Victoria. From calculations of the cost of getting coal, the Board consider that successful competition with the mines of New South Wales is not impossible; and they would advise that if a company should open a coal mine at Kilcunda, and construct a railway and a convenient shipping place, and actually produce and bring to market 50,000 tons of coal, the Government should thereafter resume the railway and shipping place, paying the company the actual cost of the same, which would probably not exceed 11,000*l*. On these works being resumed, they would then be open for general traffic, including coals raised by others; but the charges imposed for carriage should be very low indeed for coals raised by the company at whose expense the railway and shipping place were originally constructed. The board have laterly received information respecting the discovery of a seam of coal at the foot of the Strezlecki ranges. The seam is said to be 6 ft. wide, but they do not know whether this relates to its horizontal extension at the outcrop or to its thickness. Thin seams have already been discovered in this area, and they have written to the discoverer for further information.

THE MINERAL RESOURCES OF VICTORIA.

The memorandum prefixed by the Minister of Mines (Mr. William McLellan) to the Victorian Mineral Statistics for 1871 is particularly encouraging with regard to the position and prospects of the mineral interests of the colony. The gold statistics show that this branch of industry is in a prosperous state. Though the number of miners has decreased, there is a considerable increase in the yield of gold, and if the year 1872 be characterised by the industry and activity which have marked the proceedings of the miners during the previous twelve months it may safely be predicted that the yield on the average will be much greater than usual. The veins at Clunes, Stawell, Steiglitz, and Sandhurst are highly productive at great depths, and this fact ought to give confidence to capitalists, who have the means of exploring the reefs in other districts, which at the surface were known in past times to be as rich as any of those that now in Sandhurt and Stawell attract so much attention. In the beds of the shallow alluviums and deep leads in the Ballarat district, and at Fiery Creek, Ararat, and Chiltern there will be found undoubtedly at some time the rich reefs from which the gold in these deposits was derived, and there are, perhaps, no more promising fields for the prospector than these areas. As the leads are rich, so unquestionably are the reefs from which the gold came, and those reefs when discovered will add immensely to the yield of gold. It is hoped that some efforts will be made in a short time to open up the coal fields of the colony, and that the profits to be derived from raising tin, antimony, and other metalliferous ores will induce those skilled in this kind of mining to devote their labours to the exploration of such parts of the colony as are rich in these deposits.

It is to be regretted the Secretary of Mines (Mr. R. Brough Smyth), to whom we are indebted for the reports, has to complain of great difficulty in getting returns of the yield of gold from the mines in certain districts. It is suggested that the objection to give returns may may arise from the speculation which has been going on in mining scrip, and it would certainly be well for capitalists to avoid investing in districts as to which the complaint exists, for they may reasonably be suspicious that the object of the secrecy is to enable the vendors to overstate with impunity the capabilities of the properties they wish to sell. The yield of gold in 1871 was 1,368,942 ozs., and the purchases of the several banks was 45,934 ozs. greater than in the preceding year. The average contents of the quartz, estimated upon 8,528,324 tons treated, was 11 dwts. 2·71 grs. per ton: and the average of the tailings, mullock, &c., estimated upon 1,501,024 tons, was 3 dwts. 17·66 grs. per ton. Pyrites and blanketings averaged 2 ozs. 14 dwts. 5·86 grs. per ton. The mean number of miners employed during the year was 58,111, being less by 2254 than those employed during 1870. The average earning per man was 93*l*. 6s. in 1871, against 81*l*. 0s. 6d. in the previous year. This mode of estimating the productiveness of gold fields is now adopted, where practicable, in all parts of the American continent; it is obviously the only method which admits of a fair comparison of one year's yield with another, or the productiveness of one gold field with another.

With regard to metals and minerals other than gold, it is reported that no silver was raised during the year. Of tin ore there was exported during the year 250 tons, and 17,808 lbs. of tin. There were 8 cwts. of copper, the produce of the colony, exported, but none is reported to have been raised during the year. Of antimony ore there was raised during the year 1575 tons 1 cwt., and the exports were—antimony ores, 1422 tons 13 cwts.; regulus, 135 tons 6 cwts.; and of antimony 106 tons 10 cwts. There were also raised of lead ore, 45 tons; of lignite, 995 tons; of kaolin, 50 tons; and 1713 tons and 1500 square yards of flagging. The tin (black sand) raised amounted to 333 tons, the principal localities whence it was obtained being El Dorado, which contributed 250 tons; Woolshed, 40 tons; and Sebastapol, 20 tons. One copper lease for an area of 625 acres. A sample of coal recently discovered near Kilcunda gives 29·24 to 32·25 per cent. volatile hydrocarbon, 56·38 to 59·13 of fixed carbon, and 4·37 to 4·78 per cent. of ash. The report is altogether very complete and very interesting.

TIN IN QUEENSLAND.

The number of enquiries made concerning the recent discoveries of tin ore on the borders of New South Wales and Queensland shows how much interest is taken in the subject by a large section of English mining adventurers. The following extract from a letter received by me from Mr. Doyly H. Alpin, lately Government Geologist for Southern Queensland, may, therefore, be worthy of insertion, as supplementing the information afforded by the *Times* correspondent's letter of June 15, on the subject of those tin discoveries. Mr. Alpin says:—

As I have been nearly three weeks at the "head centre" of the Queensland portion of the tin district, lying on the north side of the range dividing the two colonies, I will jot down a few remarks on the subject. At present the discoveries are limited to the drainage area of the upper part of the Severn river—Quart-pot Creek and its tributaries, which form the eastern, and Broadwater, which forms the western head of that river. These have each been taken up for many miles, and the Severn, below their junction, for about 15 or 20 miles.

The character of the creeks and of the rivers also (as I have seen it) is very similar—viz., swampy beds, from one to two chains wide, with occasional water holes, sometimes of considerable length, intersected by numerous broad bars of granite. This is as they appear now, in the driest season known for the last 13 years. The alluvial bed is even now very difficult to bottom, owing to the strong under-current running through the drift. The thickness of the alluvial deposit varies from 3 ft. to 20 ft. In some places, where the depth is not more than 3 ft., tin ore is found from the roots of the grass to the bottom.

In J——'s selection, 1½ mile from the township, I saw a prospect of 2 lbs. to the dish taken from the roots of the grass, and about 4 lbs. to the dish from the subrounded quartz drift, of which there was about 1 foot in thickness on the bottom. Out of two paddocks, of about nine cubic yards each, they had washed 1 ton of stream tin from each, and from Eisenstadter's selection, close to the township, Mr.

M'Glue is washing about 1 ton per diem, employing 30 men to pump, excavate, and sluice. Out of the water holes it is quite common to get 4 lbs. and more to the dish, by standing in the water and raising the dirt out with a long-handled shovel. The richness and continuousness of these tin-bearing alluvials are extraordinary, and, I should think, quite unparalleled in any other country.

Estimating roughly, I should think that there are at least 50 miles of watercourse already taken up, in selections varying from 40 to 640 acres. Just now many of the frontages can be worked at comparatively little expense; but after the rainy season has set in capital and machinery will be required to contend with the water. Then, no doubt, many of the properties will fall into the hands of the capitalists, and work will be carried on in a proper and systematic manner. At present the working is considering as "fossicking," no definite plan being adopted, and no machinery used except Californian pumps. There will be a fine field here for English capital.

As bearing on the same subject, I would also wish to quote from a private letter received from Mr. Ulrich, the Professor of Mining and Mineralogy in Melbourne, than whom there is no better or more reliable authority in Australia, who has lately visited these tin districts, and who thus reports of them:—

As regards the tin ore, its abundance in New England, and beyond, into Queensland, is actually marvellous. On K——'s property, which consists of 1200 acres, there are about 600 acres covered by from 1 to 4 feet of surface drift, in which the tin ore is distributed at the rate of from 1 to 36 ozs. per tin dish. Another property, the E——e, has still richer surface drift.

The intelligence from other mining districts in Queensland, whether copper or gold, is almost equally encouraging, and from personal knowledge I can assert that few countries offer such inducement for the judicious investment of capital in mining pursuits as the colony I have the honour to represent. RICHARD DAINTREE,
Agent-General.

Queensland Government Offices, Charing Cross, London, July 1st.

THE BULLION PRODUCT FOR 1871.

The following is the estimate of the Commissioner of Mining Statistics of the bullion product for 1871 as compared with the two preceding years:—

	1869.	1870.	1871.
Arizona	$ 1,000,000	$ 800,000	$ 800,000
California	22,500,000	25,000,000	20,000,000
Colorado	4,000,000	3,675,000	4,663,000
Idaho	7,000,000	6,000,000	5,000,000
Montana	9,000,000	9,100,000	8,050,000
Nevada	14,000,000	16,000,000	22,500,000
New Mexico	500,000	500,000	500,000
Oregon and Washington	3,000,000	3,000,000	2,500,000
Wyoming	—	100,000	100,000
Utah	—	1,300,000	2,300,000
Other sources	500,000	525,000	250,000
Total	$61,500,000	$66,000,000	$66,663,000

The only other estimate we have seen makes the product $58,284,029, including British Columbia, but excluding Wyoming, New Mexico, and the East. That estimate is based on the express returns, with an allowance for undervaluation and private shipments of 100 per cent. in Arizona and 20 per cent. in California, Idaho, and Montana. The amount thus obtained for Arizona is less than half the actual product; that for California is probably correct, and has been adopted in round numbers in the above estimate. Idaho and Montana, as everybody knows who has travelled there, are not under the same conditions as California in the shipment of bullion, and consequently there is much more undervaluation and sending of precious metals through the United States mails and by private hands in these territories than in that State, where communications are easier and the express and insurance rates lower. The estimate to which we have referred allows $1,000,000 for shipments of ores and base bullion from Utah, whereas the value of ores shipped from the Territory during the year was about $1,020,900, and the value of the base bullion $316,150 (the weights carried by rail being 10,806 tons of the former, and 2378 tons of the latter), to say nothing of about $500,000 the value of the lead. Again Colorado is set down in the estimate referred to at $3,046,917; whereas the careful, statement already published in our columns shows the product of that Territory to have been $4,663,000.

Every item in the Commissioner's estimate (except that of Idaho) rests on satisfactory evidence, of which the express shipments form a part, but not the whole.

The smart statisticians of San Francisco are invited to try their hands at the method they followed so brilliantly last year of adding coinage to exports, by way of determining the product. The total gold and silver coinage of 1871 was $24,070,323, and the total export of bullion $26,233,912, the sum being $50,304,235, or $8,000,000 less than the estimate, which we can positively prove to be from $6,000,000 to $8,000,000 too low. It is true that they employ in their calculations not the coinage, but the domestic deposits for coinage; but this being a still smaller amount only makes the matter worse.—*Engineering and Mining Journal* (New York), June 25.

PETROLEUM.

The astounding results, both financial and material, which have accrued from the discovery of petroleum in the United States of America and in Canada are too well known to need recapitulation. Instead, however, of being confined, as was at first supposed, to a single district, it has been now demonstrated that petroleum exists in so large an area as to justify the belief that no country in the world is destitute of this valuable product. In America the trade has assumed gigantic proportions. The first export of this article was in May, 1860, when 10,000 gallons were sent to Antwerp. The total export in that year was 1,500,000 gallons, which in 1868 increased to 99,281,000 gallons, and in 1870 to 141,208,155 gallons. In England, Germany, Italy, the islands of Ottoman Archipelago, and Syria, earth oil has either been found in abundance or is known to exist; and in all probability, it will be discovered in Russia, Persia, India, and China. But there is no country in the Old World which has been so plainly proved to be a land flowing with petroleum as the United Principalities of Roumania. Over the whole of the Carpathians it oozes through the soil, and pollutes the water springs. Associated capital has been brought to bear on its extraction and export; but, strange enough, the mechanical appliances by which success has been achieved in other countries have only been recently introduced into Wallachia. Ignoring the experience of others, the Roumanian petroleum companies have been content to adopt the primitive mode of collection in use with the peasantry, by making excavations in the earth, into which the oil saturating the strata flows. By this means large quantities of petroleum have been obtained; but the continued necessity for making fresh holes or wells, with risk of the surrounding land turning out to be unproductive, not being conducive to profitable commercial working on a large scale, attention is now directed almost exclusively to deep boring, with every prospect of success.

The value of petroleum cannot well be over estimated, as the demand for the article is constantly increasing, while the knowledge of its uses is daily extending. Burning spirit and lubricating oil have heretofore been the principal products of distillation, but a new use seems likely to be found for crude petroleum as a steam fuel. In America it has supplanted coal in some manufacturing establishments, while the Governments both of the United States and Great Britain have been experimenting with the view of determining its relative superiority over coal in vessels of war. The results of the trials, with a specially constructed furnace and porous vehicle for the oil, are said to be very satisfactory; 1 lb. of oil evaporating 13 lbs. of water, with a gain of something like 40 per cent. in the power of the engine. The advantages claimed for petroleum as a steam fuel are cheapness as a generator, economy of space for storage, and greater simplicity in the arrangement of the furnace. It is needless to say that every one of these propositions is combated by some scientific man on theoretical grounds; but even assuming that the experiments have proved satisfactory, as is stated, it does not necessarily follow that petroleum could supersede coal in a country where the latter is plentiful and the former article scarce. In a country like Turkey, however, where the coal measures are undeveloped, and steam fuel has to be imported, the value of a large supply of native petroleum is of the highest possible kind. There are about 7000 flour mills in Roumania, only 30 of which are worked by steam, the remainder being worked by water, wind, horses, and oxen. There are also 1687 distilleries, 608 saw-mills, only a few of which are worked by steam; 72 breweries, 145 soap and candle manufactories, besides oil mills, &c., most of which require power in the different manufacturing processes. To such a country the possession of an abundant supply of petroleum is obviously of the greatest importance, and the increase of wealth which would result from the substitution of steam for water and wind as motors in Roumania, would be difficult to calculate.

The advantages claimed for water as a motor are, in most cases, more apparent than real. The situations are few where a steady supply of water can be relied upon during the whole year, undisturbed by either floods or droughts, and they are fewer still where an extraordinary run of water can be carried off without interfering with the driving machinery. If, therefore, the uncertainty of being able to work through the operation of the two causes named be considered, and the average expense of sustaining the banks of streams, and maintaining the walls of reservoirs and sluices be taken into account, in comparison with cheap steam, which can be generated at will, there cannot be a doubt that steam, if judged by the necessities of modern trade, is the more economical of the two. The subject is not unworthy the attention of English capitalists, and deserves the best consideration of the scientific officers of the Forte.

The director of the smelting works at Kladno, in Bohemia (Julius Jacobi), publishes a new means of separating and utilising the phosphoric acid from iron ores. The agent employed is sulphurous acid, and the phosphoric acid obtained as the result is in a state suited for direct application to agriculture. As, with the exception of the red hematites of Lancashire and Cumberland, all the iron ores of England are unsuited for conversion into Bessemer steel on account of the phosphorus they contain, this process will, if it is found to realise M. Jacobi's expectations, be exceedingly valuable.

The Records of the Geological Survey of India, of which Vols. II., III., and IV. have lately appeared, inform us that Mr. Mark Fryar, formerly of Whitley, who was appointed a few years since the mining geologist to the Indian Survey, is not only pursuing his enquiries into the condition of the known and of the suspected coal fields, but that he is introducing improved modes of working the collieries, and making, in connection with Dr. Oldham, some important experiments on utilising the small coal which has hitherto been entirely wasted.

COATING METALS.—Mr. JOHN UNWIN, of Sheffield, in specifying his improvements in the method or means of depositing nickel upon metals, and in the preparation of the articles to be coated for the reception of the nickel coating, says, "This relates to coating metals with an amalgam composed of—nitric acid, three parts; sulphuric acid, two parts; water, one part; nikel, one part, to which ammoniacal salt is added. The article to be coated is first cleansed in a solution of lime and caustic potash and then dipped in the amalgam."

FOREIGN MINING AND METALLURGY.

Prices are hardening in the French iron trade, and a further advance would probably take place if producers themselves did not see that it is to their interest to check so unnatural a movement. Rolled coke-made iron stands at 12*l.* per ton; charcoal-made ditto, 13*l.* 4s. per ton. In consequence of the present dearth of all kinds of iron, the production of charcoal-made pig is being resumed with much activity in the Haute-Marne. In the Franche Comté group also some old furnaces, which had been long since extinguished, are being re-lighted, and in this latter district it is expected that there will soon be 45 furnaces in full activity. The formation is announced of a company the object of which will be the working of a metallurgical establishment on the banks of the Seine near Charenton. The new company will take the name of the Seine Forges Company. The Eastern of France Railway Company proposes to lay down steel rails one-fourth lighter than those which are being brought into use upon the Paris, Lyons, and Mediterranean Railway. The Eastern of France Railway Company is also ordering iron rails; it has just concluded a contract with an establishment in the department of the Nord at 9*l.* 12s. 10d. per ton. These terms are below the corresponding rates current in Belgium. The contractor also gives a guarantee of three years, so that the Eastern of France Company is now laying down iron rails and points where a very heavy traffic passes over its system. Contracts, with deliveries in short periods, are still carried through with difficulty in France.

The French copper markets have exhibited a more quiet tone. At Paris, Chilian in bars delivered at Havre has made 108*l.* per ton; ditto in ingots, 112*l.*; tough English, 113*l.*; and Corocoro mineral (pure standard), 110*l.* At Havre transactions in copper have been very limited; quotations are nominal, the general price, however, being 108*l.* per ton. At Marseilles, Spanish copper in plates has made 103*l.* 4s.; small refined ingots, 106*l.* per ton, &c. After a slight period of dulness, the German copper markets have exhibited a better tone. At Paris an advance of 1*l.* per ton has been noted in Banca and English tin. Banca delivered at Havre or Paris has made 171*l.*; ditto Straits, 163*l.*; and English delivered at Havre, Paris, or Rouen, 161*l.* per ton. The Havre tin market has not revived. Tin has been firmly held in Germany, but no great variations have been noted at present in quotations. At Rotterdam a very decided advance has occurred in tin; the market has been very animated, and some important transactions have taken place in Billiton, disposable and under sail, at 92¾ fl. to 94 fl. Banca tin has risen from 94 fl. to 96¼ fl. Some purchases made on American account have given this stimulus to the market, which was already very firm in consequence of the scantiness of stocks. Disposable Billiton has become more and more rare, and is held at 94½ fl. to 95 fl. In Banca, to be delivered in the autumn, some transactions have taken place at 94 fl. At Paris, French lead delivered at Paris has made 20*l.* 8s.; Spanish delivered at Havre, 20*l.*; English delivered at Havre, 20*l.*; and Belgian and German delivered at Paris, 20*l.* 8s. per ton. Lead in saumons, first fusion, has been dealt in at Marseilles at 19*l.* 4s.; ditto, second fusion, 19*l.*; rolled pipes, 21*l.* 4s. per ton. The French zinc markets have experienced a slight advance.

A strike which has prevailed among the coal miners of the Essen (Prussia) district continues, at any rate, to some extent. The mines at which the strike has occurred employ, when in full work, 14,885 workpeople, of whom less than 3000 have been at work recently. The strike commenced on June 17, so that it has been a serious affair. The Belmez (Spain) Colliery and Metallurgical Company has presented a tolerably satisfactory balance-sheet for 1870. Including the balance brought into the account from 1870, the profit of last year was 18,465*l.* From this sum, however, a deduction of 5619*l.* must be made for general expenses, leaving a net profit of 12,846*l.* The dividend which the shareholders will receive for 1871 will be at the rate of 6 per cent. per annum.

Prices generally display more firmness in the French coal trade, and coke is also tending upwards. The Municipal Council of Paris has partly adopted the conclusions of a report of M. de Haynin, proposing that coal intended to be used for industrial purposes shall be relieved from the enormous octroi duties imposed upon it on entering Paris. The reduced duty contemplated is 1s. 3d. per ton, instead of 6s. per ton; this reduction will not, however, be general, and will only be granted to particular industries, and especially those producing articles intended for exportation. The condition of the Belgian coal trade has not materially changed, the production is carried to the maximum point, and is rapidly disposed of; there is also an absence of stocks, while prices have been maintained with an upward tendency. In concluding contracts with merchants Belgian coalowners frequently reserve to themselves the right of making an advance on Sept. 1 upon undelivered quantities of coal which they may have engaged to supply. Deliveries of coal by railway are being made with a considerable amount of activity, but there are still irregularities and delays, which augur badly for the future, and some apprehensions are entertained of another transport crisis in the autumn. A strike has occurred among the colliers employed at several of the collieries of the Couchant de Mons, but the difficulty is expected to be soon adjusted. The French Administration of Bridges and Roads is now occupying itself with the organisation of a regular haulage service between Condé and Paris.

Prices have not experienced any material variation in the Belgian iron trade. The markets still remain, however, in an expectant and rather unsettled condition. Orders do not make default at present for various descriptions of iron; many of these orders are refused, but others are accepted, especially in cases in which a long time is allowed for deliveries. Several contracts are stated to have been concluded with Belgian firms, in which the deliveries are not to be made until 1873 or 1874. Industrials who may have disposed of their future production at the present high prices are certainly to be commended for their prudence; the case of the consumer must, however, be regarded in a different light. Some rather important quantities of rails have been ordered in Belgium for English houses, and a continuance of the present exaggerated prices for iron is regarded by many as not improbable in Belgium. A contract has been let at Vienna for the ironwork of a great bridge about to be thrown over the Danube, which will comprise 3750 tons of wrought-iron and 250 tons of cast-iron. Tenders were submitted as follows:—Cael (Fives-Lille), 127,500*l.*; Harkort, 134,500*l.*; Schneider (Creusot), 144,300*l.*; Rothschild, 146,000*l.*; and Valenten and Bataille (Brussels), 173,600*l.* The works of the last-mentioned firm, and those of MM. Durieux and Co., are stated to be about to be transferred to a company, to be directed by M. Thomas.

FOREIGN MINES.

ST. JOHN DEL REY MINING COMPANY (Limited).—Advices received July 9, per Olbers:—

Morro Velho, June 1.—LOWERING OF WATER: The pumps have been kept very regularly at work, generally being driven at the rate of six strokes per minute—doing fair duty. Some hours were lost in putting in a new and larger working piece in shaft B, and in connecting the same with the general rods. The lift being now worked by the wire-rope arrangement brought from the Bahu pumping-wheel is doing good duty, and very fully supplying the upper plungers.

During the month of May the water has been lowered in the old mines as per measurement made at the new shafts 9 fathoms 2 feet 2 in., which considering the pumping power at work, the depth of the level, and body of water to be dealt with, may be considered satisfactory.

At date there is a little less than 17 fathoms of water in the A shaft, its level being 109 fathoms 2 feet 2 in. from the surface of that shaft.

Advices received July 16, *ex* steamer Neva, *via* Southampton:—

Morro Velho, June 17.—GENERAL OPERATIONS: During the past fortnight the operations of the company have been carried on regularly as regards the searching for mineral at surface in Morro Velho, the surface works for the new shafts, and the mining and reducing of mineral at Gaia. The pumping has also gone on steadily.

PRODUCE.—The gold return obtained both in Morro Velho and at Fernam Paes during the month of May amounts to 5342 oits. It has been derived as follows:—

	Oits.	Tons of stone	Oits. p. ton.
From General mineral	1769·6 from	1175 =	1·506
,, Cachoeira level ditto	987·1 ,,	595 =	1·659
	2756·7 ,,	1770 =	1·557
RE-TREATMENT.			
Morro Velho, arrastres ...Oits. 293·9	442·1	—	0·400
Praia ditto ..... 148·2			
Total Morro Velho produce	3198·8 ,,	1770 =	1·957
FERNAM PAES ESTATE.			
From Gaia Mine	2143·4 ,,	810 =	2·617

The above return of gold from the mineral available is better than might have been expected, especially from the poor mineral received for treatment in Morro Velho.

COST AND LOSS—MORRO VELHO.

The produce being	3198·8 oits.	
Less loss in melting	5·3 oits.	
	3193·5 oits., at 8s. per oit.	£1277 8 0
Cost—labour ..... Rs. 8,787 $038		
Other charges 7,710 $673		
Rs. 16,497 $711, at exchange 2s. 0¾d.		1701 6 7
Loss at Morro Velho for May		£ 423 18 7

FERNAM PAES ESTATE.

Produce, Gaia Mine	2143·4 oits.	
Less loss in melting	6·2 oits.	
	2137·2 oits., at 8s. 6d. per oit.	£ 908 6 1
Cost	Rs.4504 $620, at exchange 2s. 0¾d.	464 10 9
Profit on Fernam Paes for May		£ 443 15 4

NEW SHAFTS AND SURFACE WORKS OUTLAY.

Shafts timber, pitwork, and pumps	Rs.5037 $773, at 2s. ¾d.,	£ 519 10 5
Surface works, hauling wheel, second pumping wheel, mineral tunnel, and water-course	9688 487, ,,	999 2 6
Total	Rs.14,726 $260, ,,	£1518 13 11

The outlay above shown, on account of re-opening the mines, may appear to be large, seeing there is no sinking of the shafts going on. It should be remembered that we are preparing with a large force the new hauling wheel, a second pumping wheel, and driving the mineral and a water-course tunnels throughout May: the latter is now completed, besides the heavy stone work of the second wheel pit, which is now finished, as also the masonry foundation for the travellers.

The Morro Velho cost has been reduced to its minimum, consistent with the carrying on of the essential work.

The loss shown at Morro Velho for the month being	£423 18 7
The profit obtained at Fernam Paes being	443 15 4
Showing a small profit on both estates	£ 19 16 9

Such a result could scarcely have been expected under the actual circumstances in which we have been placed. The fact, however, affords me much gratification to be able to place on record as the result of the working operations for the month of May.

MINES.—In Morro Velho our searching for mineral at surface has been continued, and 3291 wagons of stone have been raised and delivered at the spalling-floors during the month. A large proportion of this contained scarcely any pyrites. A large quantity of earth had to be removed in order to get this stone, the earth, &c., having been thrown into the old excavations of the Bahu and Cachoeira Mines.

FERNAM PAES—GAIA MINE.—The usual quarrying of the mineral has been carried on, and a full supply has been obtained for keeping the stamps going day and night throughout the month. Some heavy timber-work has become necessary for securing by close timbering the soft footwall of this mine. The greater part of this work has been already effected.

TUNNELS BEING DRIVEN.—The mineral return tunnels from the vertical shafts have been driven as follows during May:—

From shafts towards spalling-floors	12 fms. 0 ft.
From spalling-floors towards shafts	15 fms. 1 ft.
Total driving	27 fms. 1 ft.

WATER-COURSE TUNNEL.—This tunnel for conveying water towards the second pumping-wheel has been continued and holed into the tail race of the first pumping-wheel; its length is 30 fathoms 2 feet.

PUMPING AT NEW SHAFTS.—This work has been continued very constantly, excepting only the requisite time for letting down the pumps, increasing the length of the lifts as the water becomes lower in the shafts. During the first 16 days of June the water has been lowered 23 feet 11 in., or within 1 in. of 4 fathoms, giving an average of 1 foot 6 in. per diem. Being satisfactory duty at the present depth of the large body of water now being pumped.

REDUCTION DEPARTMENT.—During May the miserably poor supply of mineral received on the spalling floors was very discouraging. The best has been done to extract as much of the gold contents as practicable. The mineral stamped amounted to 1770 tons. The sand amalgamated to 3008 cubic feet. The unrecovered gold contents in Morro Velho mineral was 0·608 oits. per ton. The unrecovered gold contents in Gaia mineral was 0·914 oits. per ton.

GOLD EXTRACTED TO DATE.—The produce from the mineral reduced in the stamps during the first eight days of June has amounted at Morro Velho and Fernam Paes to 1095 oits. It has been derived at Morro Velho:—

From.	Oits.	Tons.		Oits.
General mineral	473·5 from	289	=	1·658 per ton
Cachoeira level ditto	197·0 ,,	166	=	1·186 ,,
Total	670·5 ,,	455	=	1·473 ,,
FERNAM PAES ESTATE.				
Gaia mineral	424·5 ,,	180	=	2·358 ,,

This is quite as good produce as could be expected from the mineral available for treatment.

The health of the establishment continues good.

The gold troop was dispatched from Morro Velho on the 12th of June, taking two boxes containing six bars of gold, weighing 9379 oits., equal to 90 1-10th lbs. Troy. The gold was shipped per steamer Neva, which having arrived at Southampton, was duly forwarded to the Bank of England.

PORT PHILLIP AND COLONIAL.—Telegram, dated Galle, July 11, in anticipation of the mail leaving Melbourne on June 19, and due here on Aug. 5:—"Month ending May 21, yield per ton 4 dwts. 22 grs.: fortnight ending June 4, yield per ton 4 dwts., from quartz only. Remittance, 450*l.*"

EMMA.—The following circular has been issued by the directors:—"The directors take the earliest opportunity of announcing to their shareholders the result of the litigation with the Illinois Tunnel Company. The following is a copy of the telegram received this morning, which being partly in cypher is reliable:—'Salt Lake City, July 16.—Court granted injunction against Illinois Company, giving us possession of entire works; decided that patent gives us 2400 feet on vein, whatever direction it takes, and that Illinois Company were on our vein. Shall recover from Illinois all damages sustained. Water in mine all gone in ten days. Raising 10 tons per day; will increase to 60 tons daily in 30 days. Immense body of ore in sight; future of ore never so promising as now. Repairing cave damage at small expense. Stanley went west yesterday.—Signed—Park; Stewart; Hussey.' The result of this is not only to establish the title of the company to their own mine, but also to give them possession of the works of the Illinois Company, who had been trespassing on the Emma property. The position of the mine is sufficiently explained by the telegram, and the directors have much pleasure in congratulating the shareholders on their prospects.—By order, W. H. TOOKE, Secretary."

CAMP FLOYD (Silver).—Telegram from Capt. Shaw, the superintendent at Salt Lake:—"Mills working well; mines looking well. Will take out twenty thousand this month; forty next."

CHONTALES CONSOLIDATED.—The directors have received from Mr. Belt, dated June 5:—"Gold returned for May 333 ozs., from 1118 tons of ore; average produce 6 dwts. per ton, value 92*l.* Cost for the month 968*l.*, which includes 52*l.* for the construction of new works.' 'Mr. Belt reports:—"The new waterwheel went to work on May 20, and is working well. We are getting in the timber for the new stamps, and by next mail I expect to report great progress with them, if we have not some of them at work." The health of the establishment is good.

— J. Tonkin, Daniel Tonkin, June 4: The following report has been received for the month of May: San Antonio Mine: A stope in the back of No. 6 level has been stoped 55 varas; lode 3 ft. wide, worth 6 dwts. of gold per ton.—East San Benito: A stope in back of No. 2 level, on the north and south part of the lode, has been stoped 96½ varas; lode 3½ ft. wide, worth 7 dwts. of gold per ton. A stope in back of No. 1 has been stoped 88¼ varas; lode 3 ft. wide, worth 6 dwts. of gold per ton. The No. 2 level has been driven east on the lode 16½ varas; lode 3 ft. wide, worth 4 dwts. of gold per ton. The rise in the back of the same level has been communicated with the No. 1 level; lode 3 ft. wide, worth 4 dwts. of gold per ton.—Santo Domingo: We have cut the lode in this mine and driven on its course 26 varas; it is 4 ft. wide, worth about 3 cwts. of gold per ton. We are pleased to inform you that the East San Benito Mine has much improved during the past eight days, and we still hope to meet with some good quartz in the back of No. 1 level. We hope also to be able to get into the good ore ground at Santo Domingo during the coming month. The quantity of quartz sent to the mill is as follows:—From San Antonio Mine 161 tons, yielding 6 dwts. of gold per ton; Burrow, 70 tons, yielding 4 dwts. of gold per ton; East San Benito Mine, 887 tons, yielding 6 dwts. of gold per ton: in all 1118 tons, yielding 333 ozs. melted gold.

JAVALI.—By the last mail the directors are in receipt of advices from Capt. Sohns, dated June 6. The wet season had set in, and they had commenced grinding on June 3. They had about 2500 tons of good quartz on hand, and the men were stoping one of the best pillars in Socorro, which contains quartz of about 1 oz. to the ton. Expenditure 476*l.* 6s. 6d., which includes 130*l.* paid for freight.

SATURN.—Extract from the manager's letter, dated Salt Lake City, June 17:—"We commenced running on Tuesday night last, the 11th inst., and by to-morrow morning we shall have fully 25 tons of base bullion on the ground, which I calculate, in silver and lead, will be worth $160 per ton; or, in all, $4000 for the first week's work on one furnace. I am pressing to get another furnace started to-morrow, or day after, which, combined with that now at work, will give us $8000 return per week. This I have no doubt we can keep up through the year, as we have so fine a site for our operations. You will soon receive considerable sums of money from me, and be able to pay handsome dividends."

BATTLE MOUNTAIN.—Capt. Richards, June 27: Since my report of last week we have commenced work for conveying the water from the springs to the mine. We are digging a ditch 1½ ft. deep, in which to lay the pipes; this is necessary, to prevent the water freezing during winter, in which case we could not get a constant supply. The pipe will be ½ in., and will carry all the water that can be collected at the spring. It will be laid in the ditch, and the stuff that is taken therefrom returned to cover it. The greater number of our men (15) are engaged in this work; and, considering the rocky nature of the ground, good progress is being made thereat.—Virgin: In Jacks' stope, in the back of the 73 feet level, work is being continued, and the yield of good ore has increased. There were 365 sacks raised during the week, making 2332 sacks waiting shipment.

ANGLO-ARGENTINE.—Capt. Joseph Vivian reports for February: Operations have progressed in a satisfactory manner during the month. Weather has been very fine; surface works have, therefore, been materially advanced. The fourth amalgamating arrastre was set to work on June 18, and the fifth is far advanced towards completion. During the month 233 tons of ore have been stamped. Produce cleaned up amounts to 118 ozs. 14 dwts. 17 grs. melted gold, which includes the gold advised in March. The ore treated to date has been derived from same place as that treated in February. Appliances for further treatment of stamps tailings are in course of preparation. The second 12 heads of stamping-mill will be set to work on May 2. The mine never looked better than at present, and all that is required to make it profitably productive is a little time to erect necessary appliances for effectually treating the ore. Gold on hand 222 ozs. 7 dwts. 11 grs., which will be remitted in June, together with produce for May. The reduction officer's report states that during April 12 heads of stamps have been kept regularly at work,

and 333 tons of ore were treated; this added to 215 tons, the quantity of ore stamped in March, makes a total of 448 tons of ore treated in March and April. From the above quantity of ore 118 ozs. 14 dwts. 17 grs. of bar gold was extracted, equal to 5 dwts. 7 grs. of bar gold per ton of ore. This produce shows an increase of 19·7 grs. per ton over the average produce per ton for the preceding two months.

I. X. L.—Lewis Chalmers, June 26: Referring to my letter of the 17th inst., I think it will be possible to place the shaft considerably lower than I intended when in London, but until I get lumber sawn I cannot commence operations, as it will require timbering all the way. I need not say that every exertion is being made to start sawing as early as possible.

EXCHEQUER.—Lewis Chalmers, June 26: During the week ending the 22nd inst. the whole of the men were employed repairing the road (in the Scandinavian Canon leading to the mine), which has been rendered quite impassable by the late thaws; one bridge completely carried away, and two others almost so. The flume has also suffered very much from the weight of the snow, and the flood has entirely washed away that part which crosses the river. I have three men at work on it, and expect to have it restored in a few days. I am busy with my plans of the alterations and additions to the mill.

MAMMOTH COPPEROPOLIS OF UTAH.—Extract from manager's letter, dated Salt Lake City, June 25: I have again to report to you the surprising development going on. I send you the certificate of assay from Mr. Balland, our assayer; the results are even more surprising than those formerly sent. These specimens of quartz and ore I took from the south hill, the location which opened up since I had charge of the mine. We have now several tons of ore and quartz out of this opening. You will see by the certificate one assay shows the astonishing result of 107·3 oz. of silver and 22·7 oz. of gold to the American ton of 2000 lbs. I picked this sample myself, and certainly took no pains about it—took it casually from out the mine, little dreaming what it contained. The average of these assays gives $198.06 per ton.

ALMADA AND TIRITO.—The directors have received a telegram from San Francisco, stating that a further shipment of 63 tons (American tons), concentrated black ores had been made for Dorothea, and 18 tons same per steamer from Mazatlah; the latter may be expected home very shortly. The net profit for May is 1694*l.*, showing a considerable increase.

MALAGA (Lead).—Our reports from these mines during the past month presents many features of very great interest. As our readers are aware, the attention of the engineer and agents has been hitherto principally directed to opening up the main portion of the old workings; but as everything there is now progressing in an orderly and uniform manner, the agents have been able to devote their attention to other portions of the property, and, we are happy to say, with extremely good results. In the southern portion of the property, now called the South Mine, discoveries have been made which, we have no hesitation in saying, will materially enhance the value of the property of this company. As regards the old main workings, Capt. Cocks writes:—"We are pushing on as fast as we possibly can with No. 1 deep adit cross-cut; the ground is very hard for driving, consequently the progress is slow, but as we get near the lode we anticipate a change in the ground for the better. The stratum is similar to that in the levels above, where lead ore is made in large quantities. We are all very anxious to intersect the lode, as we feel sanguine of opening up the mine rich at this point from the appearance of the lode as gone down from the shallow level. No. 2 cross-cut we are still pushing on with all speed; the ground is favourable for driving, and highly mineralised strata. The stopes going south of No. 2 cross-cut are much the same as last reported, yielding fair quantities of rich quality lead ore, and we shall soon be able to put more men on stoping, so as to increase the get.—South Mine: You have a splendid piece of ground here, and it is opening out beyond all expectation; the lode is a fine masterly one indeed, and every prospect of its continuing so; and is, in fact, as good as any in the old mine, yielding fully 2½ tons per fathom. The stratum in which the lode is embedded is very congenial for mineral, being a blue leady ground, similar to that in England where the rich lead mines have been found; indeed, I have seldom seen a better or more kindly lode. We are now returning considerable quantities of lead ore from this lode, and as roon as we have enlarged the workings, so as to put a larger number of men on, we shall be able to make very large returns. Our dressing operations are all going on satisfactorily, and the men are all in good health." Mr. Tait Brindley writes, in a report dated June 25—"I examined the whole of the mines to-day, and beg to inform you that the upper workings and stopes in the Paquito Mine remain as usual, yielding about the same quantities of lead. The deep cross-cut level is being pushed forward as fast as possible to intersect the lodes to the deep of the present workings, but the ground is very hard, and consequently the progress made is slow. The lode in the south ground is looking really splendid, and is returning large quantities of lead; but the ground yet opened is so small that I can only have six men working; but I have started a new cross-cut, which will open out more ground, and then the get of lead will increase daily." Extract from report of Mr. Tait Brindley, dated July 3:—"I am glad to be able to inform you that things are going on well at the mines, and that the lode in the south ground is opening out beyond my expectations, and improving every fathom we drive on it, and the return of lead increases."

[For remainder of Foreign Mines see to-day's Journal.]

TIN AND COPPER IN NEW SOUTH WALES.—A letter from Sydney says that the tin excitement is very great. In May, 1871, there were but seven leases; there are now 2240 leases granted for tin mining. A gentleman engaged in the mining department under the Victorian Government was sent last month to report upon the tin mines in the New England district. Since his return he has stated his belief that the deposits of stream tin are far richer than those in any other part of the world; and he instances the Elsmore Mine as being richer than any mine in England, and expresses his opinion that in some years time a greater amount of metal will be produced from it than can be now obtained. And, lastly, as to copper, to the production of which the high price in England has communicated a great stimulus. In the Goulburn, Orange Monaco, Bathurst, and Bcurke districts rich lodes are being worked. The Cobar Mine, at Bourke, where the lode is 10 ft. in width, is said to be as rich as the Burra Burra of South Australia. Smelted specimens have yielded 7½ ounces of pure copper to 12 ounces of ore.

GOLD IN NEW SOUTH WALES—VALUABLE SHARES.—One-twelfth of a share in Paxton and Holman's claim, costing originally 250*l.*, and having had dividends since of 756*l.*, sold the other day for 1700*l.*; while 3-28ths in Rapp's sold at the rate of 12,000*l.* per share. The workers of claims along the same reef are finding that the returns are richer as they descend.

LARGE CAKES OF GOLD.—A letter from Sydney (May 18) says that a great cake of gold has been exhibited by Krohmann, and is now on its way to England, in possession of one James Brown, a fortunate digger, who travels by the out-going mail. This cake, which weighs 5000 ounces, is the result of the crushing of 1½ tons of quartz, or rather pyrites. Had specimens of the stone also forwarded to the exhibition been crushed at the same time, the mass would have weighed 5800 ozs. This cake is semi-spherical, 15 inches in diameter and 9 inches in depth at the centre. A fine cake of gold, weighing 215 ounces 14 dwts. 3 grs., has been brought in from the Dust Hole claim of Messrs. Sinclair and Hutchinson, North Junee, and lodged in the Bank of New South Wales.

There are 192 mills in the State of Nevada used in the crushing and reduction of various ores. Their capacity equals 8325 horses; they carry 2848 stamps, and costs over $10,800,000.

CHEMICALS AND MINERALS.—J. Berger Spence and Co. (Manchester, July 17:—Soda: Cream caustic, 60 per cent., 16*l.* 15s. to 17s. 5s.; white, 18*l.* to 18*l.* 5s.; soda ash, 2⅝d. to 3½d.; soda crystals, 7*l.* 10s.; bi-carbonate, 17*l.*; salt cake, 4*l.* 15s. to 5*l.*; Glauber salts, 4*l.*—Borax: Refined, 92s. 6d.—Nitrate of Soda: At 14s. 6d. to 14s. 9d.—Potash: Muriates, 80 per cent., at 9*l.* 5s. to 9*l.* 10s., f.o.b.; prussiate, red, 3s. 1d.; yellow, 1s. 6½d.; chlorate, 1s. 6d.; bicrome, 8d.; potashes, 30s. to 39s. 6d.; pearlashes, 58s.—Saltpetre: Foreign, 32s. to 33s. 6d.; refined, 36s. 6d. to 37s.—Alum: 8*l.* for loose lump; in export barrels, 8*l.* 15s.; ground, 9*l.*—Bleaching Powder: At 13*l.* to 13*l.* 10s.—Ammonia: Sulphate: White and grey, 21*l.* 10s.; brown, 20*l.* 10s., 23 per cent.; carbonate, 7d.; muriate, 28*l.* to 30*l.*; sal ammoniac, 1sts, 49s.; 2nds, 48s.—Iron Salts: Green and rusty copperas, 57s. 6d.; dry copperas, 52s.—Copper Salts: Sulphate of copper, 33*l.* 15s. to 34*l.*—Arsenic, 7*l.* 15s. to 8*l.* for white powdered.—Acid: Tartaric, at 1s. 7d.; oxalic, 1s. 1d. to 1s. 3d.; sulphuric, 3*l.* 10s. to 3*l.* 15s.; carbolic, 1s. 4d.—Magnesia: Epsom salts, 4*l.* 17s. 6d. for refined.—Pitch: At 30s.—Benzole: 30 per cent., 3s. to 3s. 3d.; 50 per cent., 3s. 3d. to 3s. 6d.; 90 per cent., 4s. 3d. to 4s. 6d.—Disinfectants: Carbolic, 10*l.*—China-clay, 26s. per ton.—Pyrites: Spanish cupreous, 8d. to 8½d.; non-cupreous, 10d.—Phosphates: Ordinary, 60 per cent., 10½d. to 11d.; high strength, 65 to 90 per cent., 1s. 4d. per unit; Estremadura, 1s. 3d. to 1s. 3½d.—Super-phosphates: 25 to 26 per cent., 3*l.* 10s. to 3*l.* 12s. 6d.—Precipitated Phosphate of Lime: 40 to 50 per cent., 5*l.* 10s. to 6*l.* 10s.—Manganese: Ores, 140s. to 150s. for 70 per cent.—Iron Ore: Hematite, 30s. to 38s.; oolitic, 7s. 3d. to 9s. 3d.

LONDON GENERAL OMNIBUS COMPANY.—Traffic returns for the week ending July 14, 11,459*l.* 8s. 10d.

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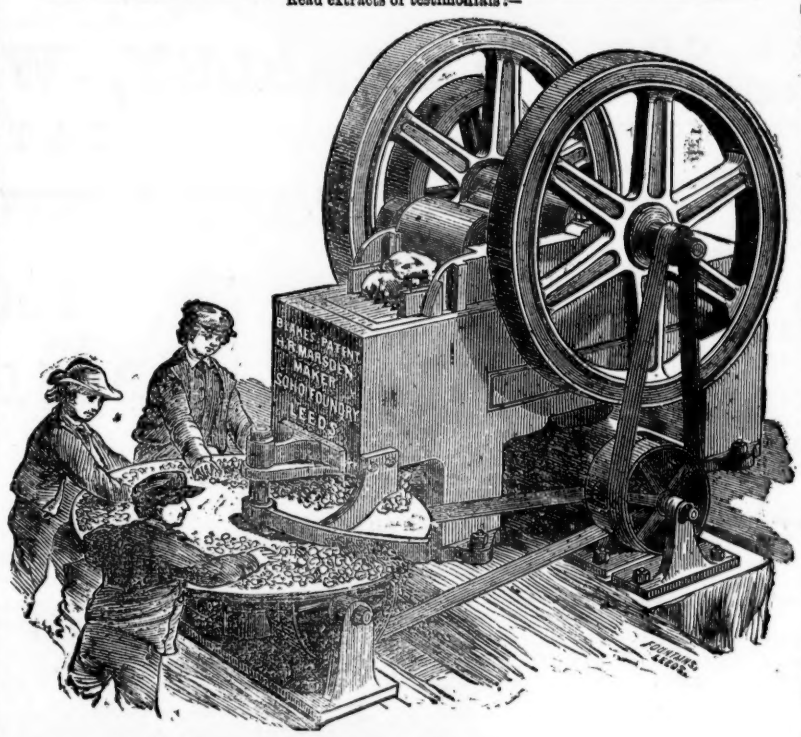
This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1½ ton of the hardest trap or whinstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS. It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States and England. Read extracts of testimonials:—



The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.
For the Parys Mining Company,
H. R. Marsden, Esq. JAMES WILLIAMS.

The Van Mining Company (Limited), Van Mines, Llanidloes, Feb. 6, 1871.—Our machine, a 10 by 7, is now breaking 180 tons of stone for the crusher every 24 hours. I may say, of all our machinery, that for simplicity of construction and dispatch in their work, they are equal to anything in the kingdom, but your stone breaker surpasses them all. W. WILLIAMS.
H. R. Marsden, Esq., Leeds.

Chacewater, Cornwall, Jan. 27, 1869.—I have great pleasure in stating that the patent stone breaker I bought of you some three years ago for mines in Chili, continues to do its work well, and gives great satisfaction. It crushes the hardest copper ore stone—put it through ¼ inch size by horse power—with great ease. I can safely recommend it to all in want of a crusher; can be driven by steam, water, or horse power.
H. R. Marsden, Esq. JAMES PHILLIPS.

Terras Tin Mining Co. (Limited), near Grampound Road, Cornwall, Jan. 1871.—Blake's patent stone crusher, supplied by you to this company, is a fascination—the wonder and admiration of the neighbourhood. Its simplicity is also surprising. Persons visiting it when not at work have been heard to remark, "This can't be all of the machine." It will crush to a small size from 8 to 10 tons of very hard and tough elvan rock per hour; taking into its leviathan jaws pieces of the hardest rock, weighing 300 lbs. or more, masticating the same into small bits with as much apparent ease and pleasure as does a horse his mouthful of oats. On every 100 tons of the rock crushed by the machine there is a direct saving to the company of not less than £5 over the process of hand labour previously adopted by them, and the indirect saving much more, the machine being ever ready to perform the duties required of it. It breaks the stuff much smaller, and in form so fitted for the stamps, that they will pulverise one-third more in a given time than when performed by hand labour.
JOS. GILBERT MARTIEN.
H. R. Marsden, Esq., Leeds.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stones and quartz. WM. DANIEL.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour.
WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours. EDWARD AARON,
H. R. Marsden, Esq. Weston, near Runcorn.

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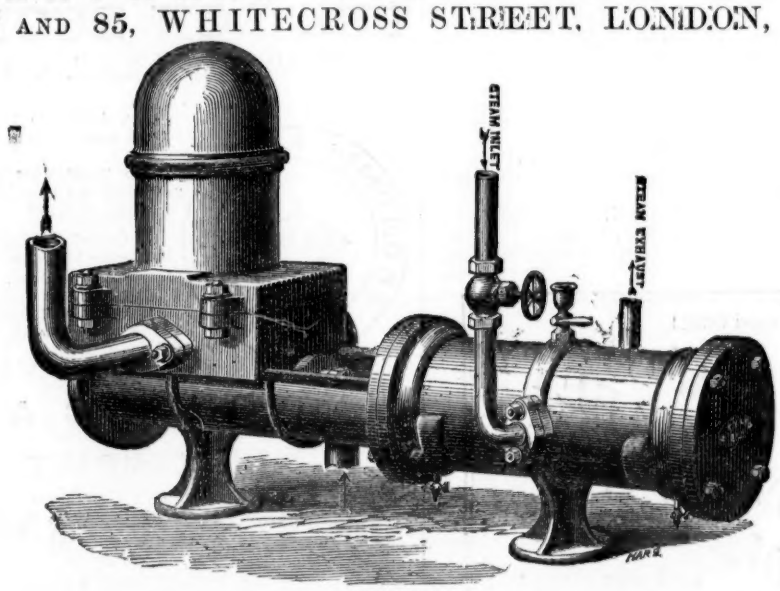

TESTIMONIALS.

Tottenham Local Board of Health, Tottenham, 12th December, 1870.
GENTLEMEN,—I have much pleasure in informing you that your Steam Pump proved itself to be one of the most useful machines for raising water that I have ever seen. It was driven night and day for nearly three months without a single hitch. The construction of the pump is so simple that any person can be taught to open it, and replace or clear the valves. I have seen no engine at all to be compared with it for mines, coal pits, or small water-works.
I am, Gentleman, faithfully yours, (Signed) P. P. MARSHALL, C.E., Surveyor.
Messrs. HAYWARD TYLER and Co., London.

Aston Main Coal Company, near Sheffield, 1st December, 1871.
To Messrs. HAYWARD TYLER and Co., 84, Upper Whitecross-street, London.
GENTLEMEN,—In answer to your enquiry, I beg to state that the two "Universal" Pumps supplied to us (through your agent, Mr. T. A. Ashton) are doing our work exceedingly well; we think they are the best in the market, and shall be glad if you will send us another 9-in. cylinder 6-in. pump, one week from this date.
Yours truly, (Signed) ASTON MAIN COAL COMPANY.

Extract of a Letter from JOHN SIMPSON, Esq., to Hayward Tyler and Co.'s Agent.
Rhos Llantwitt Colliery, Caerphilly, near Cardiff, March 4, 1872.
I should like to have the water-piston and clacks the same as in our present pump, as they work exceedingly well, and I do not think it is possible to improve upon the present pump, except by lining the cylinder with brass as ordered. (Signed) JOHN SIMPSON.

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LATE KITTOE AND BROTHERHOOD, AND FORMERLY WILLIAM FOX,

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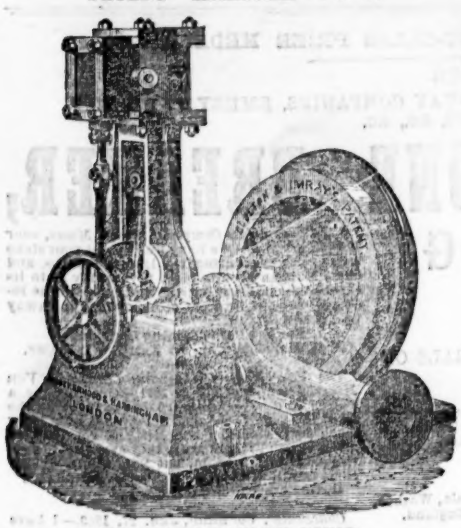

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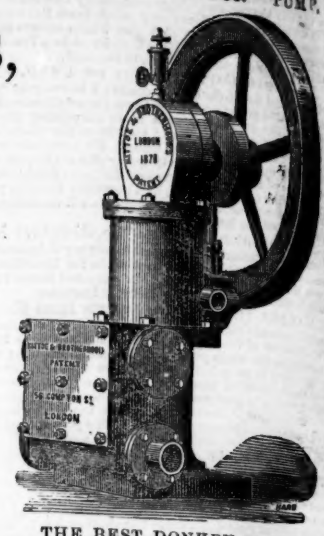

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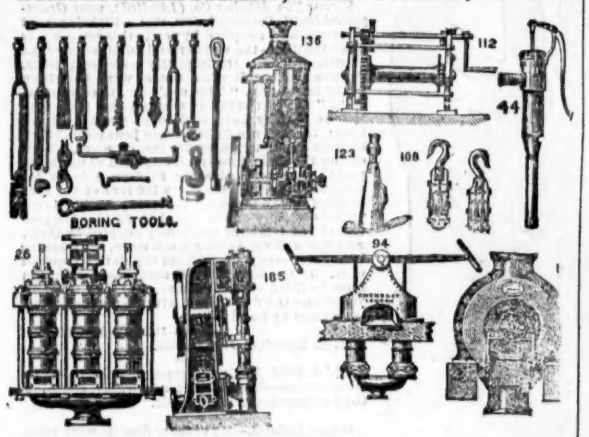

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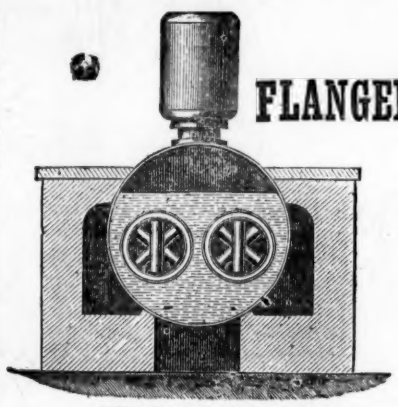

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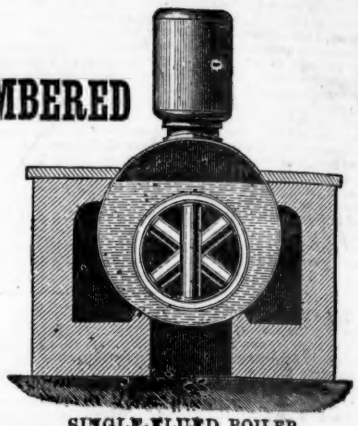

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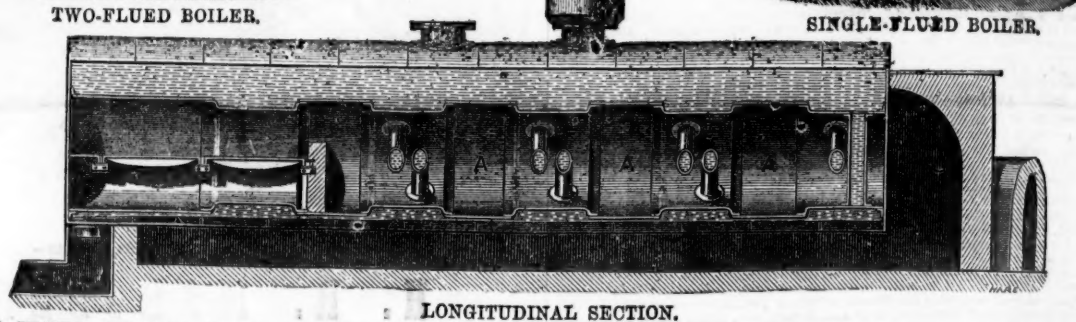

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